ANNUAL REPORT OF COMMISSIONER OF PATENTS.

REPORT

OF

THE COMMISSIONER OF PATENTS,

For the year 1843.

February 16, 1844.

Referred to the Committee on Patents.

March 12, 1844.

Resolved, That 3,000 copies of the report of the Commissioner of Patents, and 15,000 copies of said report, without the list of patents, granted or expired, or the list of claims, be printed.

Patent Office, *January* 31, 1844.

The act of March, 1837, requires the Commissioner of Patents to lay before Congress a detailed statement of the expenditures and payments, made by him from the patent fund; also, a list of all patents which have been granted during the preceding year, designating, under proper heads, the subjects of such patents, and furnishing an alphabetical list of the patentees, with their places of residence; and, also, a list of all patents which have expired during the same period, with such other information of the state and condition of the Patent Office as may be useful to Congress and the people.

The act of March 3d, 1839, likewise appropriated from the patent fund a certain amount, to be expended by the Commissioner of Patents in the collection of agricultural statistics, and to be applied to other agricultural purposes, for which he was to account in his annual report. Similar appropriations have been made in successive years.

In obedience to said acts, the Commissioner of Patents has the honor to submit his report for the year ending with the close of 1843.

Five hundred and thirty-one patents have been issued during the year 1843, including eleven re-issues, fourteen designs, and two additional improvements to former patents, of which classified and alphabetical lists are annexed, marked L and M.

During the same period, four hundred and forty-six patents have expired, as per list marked N.

The applications for patents during the year past amount to eight hundred and nineteen, and the number of caveats filed was three hundred and fifteen.

The receipts of the office for 1843 amount to $35,315 81, from which

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are to be deducted, repaid on applications withdrawn, as per statement marked A, $5,026 66. The ordinary expenses of the Patent Office for the past year, including payments for the library, and for agricultural statistics, have been $24,750 30, leaving a net balance of $4,538 85 to be accredited to the patent fund, as per statement marked B. In the above expenditure is also included the payment for the furnaces, as hereafter mentioned. For the restoration of models, records, and drawings, under the act of March 3d, 1837, $4,586 93 have been expended, as per statement marked C.

The whole number of patents issued by the United States, up to January, 1844, was 13,523. The patents granted for the year, it will be seen, have exceeded those of the previous year by 24; and the excess of applications has amounted to 58.

Such has been the progress of improvement in the arts, that every year presents a renewed demand for greater accommodations in the Patent Office. Were the Patent Office building to be occupied simply for the purposes of the Patent Office, as originally designed, it would furnish all the necessary room for many years to come. But Congress has directed that certain articles of value, belonging to the Government, and especially those received from the exploring expedition, should be deposited in the large upper hall, called the National Gallery. As it could scarcely be supposed that the intention of Congress was to exclude the Commissioner of Patents from the room, so far as needed, it has thus far been occupied in common; by which arrangement the Government, it is believed, has been well accommodated. The charge of the articles deposited there, has, since July, been committed to the Commissioner of Patents, who has now the control of the whole building, and will endeavor, with all vigilance, to protect the property intrusted to his care. The various articles brought home by the exploring expedition have been newly classified and re-arranged under the direction of Captain Wilkes, so that they now present to the visiter a gratifying and instructive exhibition of the curiosities of nature and art. Together with these, and the articles received in compliance with the wishes of the different departments, a few more have been allowed a place, which belong to the National Institute.

It must be obvious to every observer, that the hall, in its present size, though ample enough for its original design, cannot afford room for all the objects to which it is appropriated—especially as these articles are continually increasing.

The first story is absolutely insufficient to allow the models a suitable space; while but a part of the curiosities which the exploring expedition had gathered have even been opened, leaving 130 boxes still untouched. The Commissioner of Patents has felt obliged to decline, for the present, many specimens and curious fabrics offered by the manufacturer. Should, then, this cherished object of exhibiting here such works of skill, and samples of American industry, be wholly disregarded, it will be (to say the least) a serious disappointment to multitudes throughout the nation.

In devising the best method for restoring the models lost by the fire of 1836, it was believed, as has been observed in a former report, that many models would be presented for exhibition, in the hope of promoting the sale of manufactured articles, and thus the loss, in part, be repaired without charge to the Government. The extreme difficulty of effecting such a restoration after the entire destruction of the models and papers, cannot easily be appreciated. If, with every aid ingenuity can invent, the great loss can

finally be repaired, no facility for this purpose, it is presumed, will be withheld by the Government.

Can room, then, be provided, so that all the kindred objects which have a claim on the Government shall be accommodated? In reply to this question, I take the liberty to repeat the suggestions made in my report of last year,—that, by erecting a wing on the west end of the Patent Office building, additions could easily be made large enough, not only to accommodate all, but to afford room enough for the immediate commencement of lectures under the Smithsonian bequest—a disposition of the fund, I may be permitted to remark, which is anxiously expected by many citizens of the United States.

The depositories of science and art, in the Patent Office, with the adjoining botanical garden of exotic plants, would afford constantly increasing facilities for this purpose; while the offer of free lectures could not fail to produce the most happy results. Thousands would resort hither from every part of our land, to attend a course of lectures at the seat of Government; talents which lie buried, and are now lost to the country, would be drawn forth; and the effects of the instruction obtained would be exhibited in the increased improvements of the people in the various States in the Union.

The report on agricultural statistics will be found in the document marked D. In the preparation of this report, an extended correspondence has been opened both at home and abroad; numerous American and foreign publications have been procured and consulted, and the result is presented with an increasing confidence in its accuracy. The deep interest which is felt in this part of the report of the Commissioner of Patents has been manifested in the constant application to this office for copies; which could not be supplied, notwithstanding the extra number printed by order of Congress. Additional information has been obtained respecting further improvements in manures, crops, seeds, and implements, and such new applications of agricultural productions as promise to be useful to our country. Twelve thousand packages of seeds will have been distributed from the Patent Office this year; and when we recollect, as mentioned in a former report, that the improvement of 10 per cent., by the selection of seeds, would increase the value of the agricultural products $30,000,000 annually, the attempt thus far made by this office must be deemed a good beginning for still more extended benefits.

As one means to the end proposed, a more systematic effort to obtain suitable seeds, through the instrumentality of our diplomatic corps, would be desirable. In foreign publications, notices of superior varieties of grain occur, showing, in the simplest manner, the items of expense; and some of these varieties could, doubtless, be advantageously acclimated in our country. For instance, *rice* is now cultivated in high latitudes in Europe. A hardy kind also flourishes on the edge of the snows of the Himalaya mountains; and there is every reason to believe upland rice may be raised wherever Indian corn will ripen. Such is now the opinion in Europe; and some seed has been ordered, which I hope before long to receive for distribution.

The public journals in England and this country have also given account of an extraordinary kind of grain, called the multicole rye, raised in the west of France, the prolific qualities of which almost exceed belief. Such accounts of it as could be obtained, will be found in the agricultural statistics, under the proper head. The numerous inquiries for the seed induced me to import a few bushels from France, for distribution; and even should the product fall far below the amount mentioned as common there, the experiment will be gratifying to many.

My attention has also been turned to our foreign produce market, and to ascertain the defects of our shipments, and what agricultural articles could further be added to our marketable products abroad; and much information on these subjects, as well as the preparation of articles for our foreign trade, will be found in the agricultural statistics, and the appendixes there subjoined. A tariff of duties on American agricultural productions in foreign countries, the price of freight, and a number of *pro forma* bills of sale, have likewise been added, for the benefit of both the exporter and producer.

The information given in that paper, also, in respect to granulating and clarifying sugar, preserving butter in hot climates, and flour for exportation; the further applications of lard and lard-oil, feeding of stock, varieties of products, manures, and other topics, will, it is believed, interest a large portion of the people of our country.

In my last report, I alluded to the importance of appropriating more labor to the preparation of agricultural statistics.

The annual reports will show that much time is necessarily occupied in collecting information. The materials are to be gathered both at home and from abroad. Vastly more might be done, and with still greater accuracy, were the energies of an individual devoted to this subject. The present duty on my part is, in a great measure, performed out of office hours. The examination of agricultural journals and correspondence is the means now chiefly employed for the purpose of gaining information. Personal conversation, and occasional journeys, have likewise afforded some aid in the prosecution of the object. While engaged in this duty, I have felt a strong desire to visit the cotton, rice, and sugar plantations, as well as the corn and wheat growing sections of our country; to examine the course of improvements, or the reason of failures; and to gather all the information practicable for the public benefit. The expense of such an exploration would be small, and might be charged to the patent fund, leaving still an annual surplus for other purposes.

Allusion to personal feeling may possibly seem out of place. The past, however, is a pledge that I cherish at least a strong desire to aid the agricultural community, embracing by far the larger portion of our whole population.

During the eight years that I have had the honor to superintend the bureau intrusted to my charge, it has been wholly reorganized; and within this time, it will be recollected, all its papers and records have been destroyed, but are now mostly restored. Having been instrumental in the reorganization, I felt desirous to carry out the plan then proposed. The time has now arrived when my duties might be changed without injury to the public service. I pretend not to say how much could be done; but I venture the opinion, that an appropriation to cover the expenses of a single year, in the prosecution of an object so important, would never be regretted. The country might understand more fully its resources, and Congress be enabled to legislate with still greater prospect of benefiting all the parts of our common Union.

I have this year caused to be prepared, (and it might be printed as an appendix to my report,) *claims* of patents granted during the year, marked O. Should Congress think proper to publish the same, the people of this country would know how far they are restricted in the use of common rights. At the present moment, no periodical publishes these claims; and hence the

daily application made to the office for the same. Nearly one-half of the applications for patents are rejected; others, on an average, are reduced at least one third, so that in many cases little remains; and yet there is enough to sustain a patent, and justify the inventor in making sales. The object presented by the patentee may be one captivating to the eye, and of great importance; while the claim allowed is of little consequence, as it may merely be a combination of some trifling parts, which can be omitted without much injury, or avoided by a substitution of something else equally useful. This remark may be illustrated by a single example—that of "Bommer's (so called) patent manure." In this case, a patent was obtained, and contributions levied on the farmers of our country for a mere process, highly extolled by most of the agricultural journals; but a reference to the claim allowed shows us that another person (not Bommer) was the patentee, which he alleged to be an improvement on a French invention. In the claim allowed him, the right was given—not of making the *lye*, or *liquid preparation*, used in the manufacture; for this was already known—but simply for pouring the lye in a particular manner upon the heap as prepared. On reading the claim allowed, any one would see its extent, and would at once be spared the payment of twenty dollars demanded for the patent-right. Jaufrett's patent, under the name of Rosser, by whom it was introduced into England, of which the American claims to be an improvement, will be found in full, with other information respecting it, in Appendix No. 22, subjoined to the agricultural statistics.

The publication of these claims would also aid the officers in their daily examinations, as they present in a few pages the substance of every patent granted during the year. It would save the demand for many copies, which is now a severe tax on the office, as the charge allowed is but ten cents per hundred words, and the claims will not average above twelve or fifteen lines each—a compensation wholly inadequate for the time bestowed in searching out and copying them.

It may be added, that foreign nations, with few exceptions, publish *in extenso* the patents granted in their respective countries. The same thing has been attempted in this country; but, from want of the necessary patronage, even the publication of the claims has not been continued, except for a short time, by any periodicals.

Several editors have offered to publish the claims, provided they could be furnished to them free of charge. It is confidently hoped, therefore, that Congress will see fit to publish the same with the present annual report, that the country at large may be acquainted with the rights of inventors. The document will be especially useful to those who are employed to aid in preparing the papers of future applicants for patents.

It has been suggested that a notice of the progress of the arts should form a more prominent part in the annual report of the Commissioner of Patents. I trust, therefore, that a glance at the improvements made within a few years will now be considered a valuable addition to the topics heretofore embraced in my reports. The subject is too comprehensive a one for great details; but the papers prepared for this purpose, marked E and F, are full of encouragement and gratification to the American people.

The advancement of the arts from year to year taxes our credulity, and seems to presage the arrival of that period when human improvement must end.

Another consideration has induced me to request the examiners in this office to prepare these reports on the progress of inventions. The expe-

rience and information which they have acquired are the result of long study and close observation ; and hence the propriety of recording the knowledge, which might be lost in the event of their being taken from their labors.

The importance of this collected information to the public generally, but more especially to those who at any time hereafter might be called to fill the same station, will be readily appreciated on a perusal of these papers. I ought, also, to remark, that the salaries paid to the examiners and some of the clerks are an inadequate compensation for their invaluable services. If there is any bureau where are needed scientific attainments of a high order, it is in the Patent Office.

The furnaces first erected to warm the Patent Office, like those in the General Post Office, have proved injurious to health, by the escape of gas ; and were also made of such perishable materials, that it has become necessary to take them out, and substitute others of cast iron, of new construction, which have been recently patented. These cost far less at the outset, require a smaller supply of coal, need but trifling repairs, and can be easily introduced.

This absolutely necessary expense has been charged to the Patent Office fund, under the head of "contingencies for repairs." In the operation of these new furnaces, a curious effect is produced by particular ventilation, and deserves remark. Ventilation is often obtained through the ceiling only ; but, so far as it respects rooms heated by hot-air furnaces only, this method is an incorrect one. If the temperature of the different parts of the room is tested by a thermometer, it will be found that the upper part heats first ; and if no outlet is given, the draught of hot air ceases, the room being filled. Let an aperture be made at the top of the room, and the warm air instantly escapes ; but if an opening is made near the floor, the cold air within the room passes out, and the warm air descends to fill the space.

An experiment, proving this, was tried in drying clothes in a room without ventilation, heated by air furnaces ; the clothes that were in the upper part of the room dried well, while those in the lower part still continued moist. As soon, however, as an aperture was made for ventilation below, a draught was given to the furnace, the cold air expelled, and the clothes dried rapidly. The public will thus see how easily a serious difficulty in heating rooms may be overcome.

In my last report, an account was given of a mode of constructing cheap cottages of unburnt brick. The numerous experiments of a similar kind since attempted in the United States, and the satisfaction there experienced, together with the repeated inquiries on this subject, lead me to remark that from accounts of the similar use of such bricks in Egypt, it is proved that they have been found undecayed and sound in arches which have even stood the lapse of 2,000 years. The cottage erected by myself on Massachusetts avenue, in full sight of the Capitol, and which is two stories in height, stands well, and appears as handsome as the best brick houses ; and being warm in winter, and cool in summer, justifies me fully in recommending a similar mode of building, especially where clay is abundant and timber scarce.

Some have doubted the policy of erecting such houses in cold climates ; but it may be remarked that in Canada these buildings have been successfully proved, as will be seen by a reference to the paper marked G.

Some facts have been collected respecting plank roads, that may be interesting to those sections of our country where facilities for the transporta-

tion of passengers and produce are so much needed. The description of these roads, as used in Canada, may be found in an appendix belonging to the agricultural statistics, marked D.

A description of a process for preserving wood, by Dr. Boucherie, as furnished by a report of the French Academy, may be found in another paper, marked H.

By means of another preparation, by exhausting the air, and then infusing sulphate of iron or other substances into the pores of wood for railroads, it is said the wood has been rendered so hard that the iron wheel of the car leaves no trace after more than a year's use of this "metallic" wood.

By a valuable machine, with ten yoke of oxen and five hands, a ditch of suitable depth for draining lands, (14 inches deep, and 28 inches wide at the top,) ten miles may be excavated in one day, at an expense, by contract, of not more than three cents per rod. A larger machine, with a greater number of oxen, will excavate a ditch three feet deep. The great importance of such an instrument on the prairies of the west will at once be seen and acknowledged.

The rapid improvement of the arts may help to account for the reduction of price as to many articles of manufacture, and especially in some that are usually ranked among the necessaries of life. Individuals now in Congress can recollect of having, thirty years since, purchased shirting at 62½ cents per yard, who the last year have bought that which was equally good for 11 cents per yard only.

Hosiery, too, is now made in this country with astonishing rapidity, by the aid of the power-weaving loom—an American invention, and which has not yet been introduced into England. While, there, it is a full day's work to knit by hand two pairs of drawers, a girl here (at $2 50 per week) will make, by the power-loom, twenty pairs in the same time. A piece 28 inches in width, and 1 inch long, can be knit in one minute.

The expense of manufacturing this article has thus been reduced to about one-tenth of the former method by hand-looms. The importance of this improvement may be estimated from the fact that the quantity of hosiery used in the United States is valued at $2,500,000; and the stockings, woven shirts, and drawers made in this country, at $500,000.

The little article of hooks and eyes is another illustration of the same progress of inventive industry. Thirty years ago, the price was $1 50 the gross pairs; now, the same quantity may be purchased from 15 to 20 cents. At one establishment in New Britain, Connecticut, 80,000 to 100,000 pairs per day are made and plated by a galvanic battery, or the cold silver process. The value of this article consumed in a year in this country is said to be $750,000.

Another article very essential to the husbandman, *horse-shoes*, furnishes a similar proof of the bearing of the progress of inventions. An improved kind of horse shoes made at Troy, New York, for some time past, is now sold at the price of only five cents per pound, ready prepared, to be used in shoeing the animal. At a factory recently erected, fifty tons of these are now turned out per day; and it is thought they can be made and sent to Europe at as good a profit as is derived from American clocks, which have handsomely remunerated the exporter.

The improvements in the manufacture and making up of leather have also greatly reduced the price of another article—shoes. By further in-

ventions to render leather water-proof likewise, much has been done to protect the health and promote economy. Those who have not turned their attention to this subject may be surprised to learn that leather made water-proof in the best manner will last at least one-third longer than other kinds. Allowing, therefore, three dollars per head for each person in the United States for shoes, the cost of this article in the whole country would be $50,000,000; one-third of which saved, would be over $16,000,000. Some of the preparations for rendering leather water-proof are much less expensive than others. A very simple composition of rosin, bees-wax, and tallow applied warm, both to the soles and uppers, so that the leather is thoroughly saturated with the mixture, has been found to be very effectual for the purpose.

During my late visit to New York, I visited the sugar-works of Messrs. Tyler & Mapes, in Leonard street; which establishment has adopted the new process of sugar-making invented by Professor Mapes. By this process they manufacture from 15,000 to 20,000 pounds of sugar per day from common West India molasses, and generally of a quality superior to that made from the cane in Louisiana. They often use molasses which has become sour, with good effect.

I also saw the new evaporator invented by Professor Mapes, at a sugar-house in Vandam street. This evaporator is of a small size—something less than five feet square and twelve inches deep; it was charged with a solution of sugar at thirty degrees Beaumé, (say 125 gallons,) and commenced boiling rapidly in less than thirty seconds from the time of turning on the steam. This pan will reduce sufficient of such liquor (taken luke-warm) to the proof, or sugar point, in fifteen minutes, to make 1,000 pounds of sugar; and this, as the proprietor of the establishment informed me, of a quality far superior to that which he was enabled to make by the usual process. Indeed, so rapid is its action, that the same quantity of sugar which required twelve hours for its manipulation, is now finished with ease in three hours—giving a larger yield, and of better quality.

As Professor Mapes is now taking patents in this country and abroad for this evaporator, a new filter, and some other improvements connected with sugar-making and sugar-refining, I cannot with propriety describe his machines; but, from what I saw, am convinced that they are calculated to effect a great change in the whole system of sugar-making in Louisiana and the West India islands.

This largest size evaporator is capable of evaporating 1,000 gallons or more of water per hour; and the smallest (such as described above) from 230 to 250 gallons per hour.

As an evidence of the improvement in making loaf-sugar, I would add, that, by the new process, the refining by the aid of clay is abandoned. This old process requires at least thirty days to complete the loaf for market; whereas the improved mode accomplishes the same in six days—thus making a vast saving in time, machinery, and room.

This evaporator will undoubtedly be introduced for salt-making, concentration of extracts of dye-woods, &c.

In the paper marked I, will be found a description of the electro-magnetic telegraph, illustrated by plates, in language so familiar as to enable any person to understand one of the great improvements of the age—one that is destined to exercise a great, and, it is believed, happy effect in the transmission of intelligence from one section of the country to another. Experi-

ments, already made in England and on the continent, leave no doubt of its practicability; and this will ere long be further tested on the railroad route between Washington and Baltimore.

The choice as to the mode of communication by wires placed within leaden pipes under ground, or through similar wires suspended in the air, has occasioned much perplexity to the scientific; but the latter will probably be found much the most economical in its first structure, as well as in the facility of repair. The rapidity of communication is truly astonishing; it is instantaneous. The rate at which the electro magnetic fluid passes, according to Mr. Wheatstone, is 288,000 miles (equal to 11½ times around the globe) in one second. We see the "streak" of lightning in the heavens, but it leaves no trace; the stream of electricity has passed in less than the twinkling of an eye, and is gone far beyond our sight. In the same manner, with equal swiftness, the electro-magnetic fluid unerringly conveys the intelligence intrusted to its operation.

Foreigners are now claiming the merit of the invention to reduce the discovery to practice; yet history, it is believed, will herafter accredit the highest and most deserved commendation to one of our countrymen.

A new field is thus laid open for the researches of science, and new discoveries may yet be expected. Experiments have already been made in the country, with wires of 160 miles in length, insulated in coils, with perfect success. A small battery of 100 pairs of plates was sufficient for the operation of the whole distance. In effecting the transmission of intelligence by the telegraph, the artificial magnet, (see the paper I, above mentioned,) created by electricity, sets in motion an apparatus, which gives on paper certain characters, representing letters of the alphabet. Communications are thus recorded, either by day or night, on a revolving cylinder, without even superintendence, and may be transcribed at leisure. The medium employed is simply a copper wire insulated and extended on posts, at an expense not exceeding $150 per mile. It is confidently believed that proprietors will thus connect their dwellings with the places of their mechanical operations. How easily, for instance, could Boston and Lowell be thus connected? The same posts, too, would answer for many lines of communication. Each wire, however, must be insulated; and, strange as it may seem, if two wires are placed horizontally at some distance apart, and one is charged, a similar effect will be produced on the other.

Among the most curious effects attending this discovery, is the transmission of intelligence, through a single wire, at the same time, from opposite points. Thus, on a wire reaching from Washington to Baltimore, a message, by electricity, will pass another traversing in a contrary direction, (turning out as it were,) without any detention. Like the rays of light, electricity too is extremely subtle. Nor is the fact less astonishing, that the ground itself is a good conductor, and supplies the place of another wire, which is necessary in ordinary cases before any effect is produced.

The advantages of this mode of communication must be obvious, both in war and peace. The east and the west, the north and the south, can enjoy the earliest intelligence of the markets, and thus be prepared against speculation. Criminals will be deterred from the commission of crimes, under the hope of escape upon the "iron horse;" for the mandate of justice, outrunning their flight, will greet their arrival at the first stopping-place. The numerous inquiries respecting the telegraph have led me to notice it with this particularity.

I may further add, that the plates illustrating the electro-magnetic telegraph exhibit another important invention—that of preparing maps and plates by the process called *cerography*. This is a new art. It is now more than nine years since a gentleman of New York city conceived the idea of this new mode of engraving, which combines in a good degree the peculiar advantages of all the old methods, viz: the facility of lithography in preparing the plate for the press; the clear fine flowing lines of copper-plate engraving; and the durability under the press, and rapidity in printing, of wood engravings. The value of cerography in furnishing the community with *cheap* maps, may be inferred from the fact that the eight quarto maps furnished gratuitously to the 17,000 subscribers of the New York Observer, published by the inventor, if charged at the rates usually allowed for maps of the same size in England and the United States, would have cost $125,000.

A description of the mode of laying the pipes for the telegraph, by means of a newly-invented plough, will likewise be found in the paper above mentioned, marked K.

Intimately connected with this branch of science employed in effecting the results obtained by the telegraph, are the medicinal applications by the magnetic battery, mentioned in the report of one of the examiners. This same wonderful agent—the electro-magnetic-fluid—which also gilds the metals, and separates the beautiful ores, dissolves the calculus (stone in the bladder) without pain; rescuing thus many victims, otherwise doomed to a lingering death, or the sad alternative of a more excruciating operation. The facility with which medicines are infused into the system, by the aid of this battery, leads us to hail the approach of a quicker alleviation of human woes, and the future success of experiments, fraught with the brightest anticipations.

The experiment of illuminating the streets of Paris by means of the electric spark, has, as communicated in the late scientific journals, been also most successful; and further developments of this application of electricity may be expected. This is, indeed, as it were, chaining the lightning to subserve the purposes of human improvement.

On the review of the whole combined variety of topics embraced in this report, I trust, should it at first seem unduly extended, it will be found that, while nothing collected during the past year which is deemed interesting has been withheld, so nothing has been added unworthy of perusal.

All of which is respectfully submitted:

H. L. ELLSWORTH,
Commissioner of Patents.

To the Hon. SPEAKER *of the House of Representatives.*

A.

Statement of receipts for patents, caveats, disclaimers, improvements, and certified copies, in the year 1843.

Amount received for patents, caveats, &c.	$33,913 53	
Amount received for office fees	1,402 28	
		$35,315 81
Deduct repaid on withdrawals		6,026 66
		29,289 15

B.

Statement of expenditures and payments made from the patent fund, by H. L. Ellsworth, Commissioner, from January 1 *to December* 31, 1843, *inclusive, under the act of March* 3, 1839.

For salaries	$16,350 00	
For temporary clerks	3,013 56	
For contingent expenses	4,404 76	
For the library	437 31	
For agricultural statistics	444 67	
For compensation to the Chief Justice of the District of Columbia	100 00	
		24,750 30
Leaving a net balance to the credit of the patent fund		4,538 85

C.

Statement of expenditures on the restoration of the Patent Office, under the act of March 3, 1837.

For draughtsmen	$2,100 00
For examiner and register	166 00
For restoring records of patents	234 00
For restored drawings	35 00
For model cases and restored models	1,513 55
For freight and expenses on models	538 38
	4,586 93

D.

Tabular estimate of the crops for 1843.

State or Territory.	Population in 1840.	Present estimated population.	Wheat.	Barley.	Oats.	Rye.	Buckwheat.	Indian corn.
			Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Maine	501,973	542,145	785,484	273,554	1,138,007	159,672	62,5[illegible]8	1,390,799
New Hampshire	284,574	288,170	534,782	111,643	1,470,663	378,209	140,180	330,925
Massachusetts	737,699	786,815	190,726	134,655	1,468,361	600,239	107,583	2,347,451
Rhode Island	108,830	113,482	3,376	51,959	190,303	44,617	3,845	578,720
Connecticut	309,978	314,902	94,622	26,495	1,424,444	934,234	387,463	1,926,458
Vermont	291,948	295,862	620,695	46,250	2,721,374	278,709	229,053	1,252,853
New York	2,428,921	2,643,095	12,479,499	1,802,982	24,907,553	3,677,222	2,398,354	15,574,590
New Jersey	373,306	394,298	971,727	9,733	3,286,438	2,335,987	682,235	5,805,121
Pennsylvania	1,724,033	1,874,353	12,215,230	150,398	19,826,938	9,429,637	2,408,508	15,857,431
Delaware	78,085	78,417	333,197	4,508	862,819	42,486	11,560	2,739,982
Maryland	470,019	479,197	3,391,535	3,246	2,817,200	779,836	94,046	6,205,282
Virginia	1,239,797	1,251,153	9,004,359	89,317	12,879,878	1,249,329	360,635	45,836,788
North Carolina	753,419	759,591	2,237,661	3,808	4,858,989	243,218	21,378	27,916,077
South Carolina	594,398	800,182	1,326,974	3,686	1,744,198	56,848	–	18,190,913
Georgia	691,392	841,580	2,463,771	12,346	1,586,797	75,578	588	26,960,687
Alabama	590,756	703,236	906,909	7,942	1,736,038	68,442	72	24,817,089
Mississippi	375,651	511,263	429,384	1,894	983,228	15,492	94	9,386,399
Louisiana	352,411	407,723	–	–	126,583	2,193	–	8,957,392
Tennessee	829,210	888,130	6,317,254	4,567	9,224,053	381,164	22,620	67,838,477
Kentucky	779,828	816,592	4,674,845	14,601	9,918,881	2,106,469	11,618	59,355,156
Ohio	1,519,467	1,756,091	18,786,705	181,833	16,313,403	934,440	659,695	38,651,128
Indiana	685,866	822,598	7,225,566	28,862	9,268,337	199,755	61,115	36,677,171
Illinois	476,183	692,653	4,829,182	84,033	8,639,231	124,237	79,326	32,760,434
Missouri	383,102	481,598	1,089,777	9,583	3,643,933	71,709	16,815	27,148,608
Arkansas	97,574	124,446	2,986,705	878	344,717	9,465	140	8,754,204
Michigan	212,267	284,395	5,296,271	143,757	3,210,716	64,195	167,212	3,592,482
Florida	54,477	62,373	686	50	14,919	361	–	838,667
Wisconsin	30,945	49,521	606,740	16,324	833,247	3,689	20,455	750,775
Iowa	43,112	69,478	495,611	1,505	474,856	7,360	11,906	2,128,416
District of Columbia	43,712	50,244	11,583	312	13,862	5,479	346	47,837
	17,069,453	19,183,583	100,310,856	3,220,721	145,929,966	24,280,271	7,959,410	494,618,306

ERRATA(Slip, found in set belonging to Library of Congress) copied 2/28/41

In the table, page 13, article "sugar" for Louisiana, for 37,173,590, read 97,173,590.

Also, in the footing of the same column, for 66,400,310 read 126,400,310.

Also, on page 99, line 13th from the bottom, for 66,400,310, read 126,400,310.

TABULAR ESTIMATE—Continued.

State or Territory.	Potatoes.	Hay.	Flax and hemp.	Tobacco.	Cotton.	Rice.	Silk.	Sugar.	Wine.
	Bushels.	*Tons.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Gallons.*
Maine	10,253,531	1,000,923	3,874	78	-	-	680	151,458	2,392
New Hampshire	6,191,071	547,842	23,379	277	-	-	880	102,497	101
Massachusetts	4,175,251	829,987	832	93,891	-	-	30,153	282,648	209
Rhode Island	902,387	54,300	93½	481	-	-	912	30	785
Connecticut	2,822,295	602,906	4,248	601,282	-	-	140,971	31,220	1,923
Vermont	8,209,571	1,100,737	29½	742	-	-	7,194	3,075,447	109
New York	26,553,612	4,295,536	1,947	1,052	-	-	5,238	6,934,616	5,554
New Jersey	2,426,457	359,452	1,235	2,840	-	-	4,166	39	9,398
Pennsylvania	9,161,409	1,899,128	3,527	441,944	-	-	26,482	878,73[illegible]	18,983
Delaware	257,911	20,338	65	381	-	-	3,586	-	273
Maryland	908,330	106,270	615½	20,775,702	7,677	-	6,829	-	7,124
Virginia	3,132,243	466,482	31,728	41,918,040	3,353,756	3,084	6,180	938,457	13,045
North Carolina	4,517,863	141,436	13,569	14,548,785	46,934,276	3,324,066	6,443	5,376	37,347
South Carolina	3,918,405	29,864	-	50,254	55,219,697	66,892,807	5,546	18,962	672
Georgia	2,408,623	20,731	14	130,201	185,758,138	14,019,250	6,134	224,395	8,961
Alabama	1,749,057	20,136	7½	248,177	112,020,112	166,581	5,743	7,081	355
Mississippi	2,814,929	877	25¾	140,855	162,664,350	953,654	223	87	17
Louisiana	1,311,700	32,390	-	111,057	128,912,253	3,920,490	1,055	37,173,590	2,601
Tennessee	1,864,636	50,516	4,399	29,335,868	32,938,410	8,700	20,072	368,203	696
Kentucky	1,246,469	136,926	9,508	52,322,543	737,684	17,062	4,733	1,957,858	1,838
Ohio	6,462,248	1,407,510	12,664	5,991,296	-	-	25,202	5,850,558	14,597
Indiana	2,858,746	1,621,606	12,150	2,899,844	168	-	840	5,892,405	11,432
Illinois	3,867,661	280,383	2,879	965,260	214,007	732	3,400	412,363	794
Missouri	1,213,984	74,966	30,300	14,700,089	149,889	-	210	317,376	34
Arkansas	534,260	880	1,977	216,508	11,520,467	6,612	217	2,111	
Michigan	4,465,871	223,827	1,280	3,187	-	-	1,395	1,307,629	
Florida	373,806	1,561	3	155,509	7,229,206	566,107	415	249,322	
Wisconsin	710,607	61,965	4	425	-	-	28	162,034	
Iowa	390,765	28,599	654	13,271	-	-	-	55,899	
District of Columbia	52,435	1,733	-	61,715	-	-	1,038		
	105,756,133	15,419,807	161,007¾	185,731,554	747,660,090	89,879,145	315,965	66,400,310	139,240

REMARKS ON THE TABULAR ESTIMATE.

The results of an extended examination into a great variety of sources of information are embodied in the tabular estimate of crops now presented. The elements from which the data are compounded, are the same as those mentioned in the report of the Commissioner of Patents submitted to Congress February 1, 1843. Among these, are—

1. *The average annual increase of population.*—To this increase additions have been made in the case of States or Territories where there is reason to suppose the amount of immigration has exceeded that of former years—as in Iowa, Wisconsin, Missouri, and Michigan; while from some others, which have sent out a larger portion of their population than usual, a deduction has been thought necessary.

2. *The new lands brought under cultivation; new means of communication, markets, and revival of business.*—These causes have had an important influence the past year—probably greater than in the former years. Some new markets have been opened for particular articles, as well as the application of products in manufacture; of which notice will hereafter be taken. The number of persons who have thus been turned from the direct prosecution of agriculture to other pursuits, is, no doubt, considerable.

3. The third specified element (the *accidental* or *occasional*) has likewise exerted its influence in modifying the results of the year. Some of the crops are so much later in coming to maturity than others, and do not require to be planted as early by several weeks or months, that the farmer has an opportunity to learn the probabilities of success in time to supply the loss of one product, by sowing or planting another. This applies, perhaps, more especially to certain crops, as the ROOT CROPS, which are not enumerated in the tabular estimate; but it is, to some degree, applicable to the winter grains, compared with maize or Indian corn, and potatoes.

4. *The peculiarities of the season* have this year been most decisive on the results of the crops. Indeed, the uniformity in this respect, the past year, has been more striking than usual. A comparison of the agricultural journals and tables of the weather furnishes a very extensive exhibition of this result. It is true that the difference of situation, as regards the climate, face of the country, soil, vicinity to the ocean, rivers, or lakes, contributes to modify this element, and to prevent that universal similarity which would be otherwise seen. But the approximation of the extremes of the several parts of our country, as regards climate, is a fact which will scarcely be denied by any one who is in the habit of reflecting on this subject. The richness of a soil often exercises no little influence in making it warmer, which often tends to counteract the effect of the weather. Thus, the rich soil in the west will yield a fine crop of grain, even though the sky may have been cloudy, and the weather comparatively unfavorable; when the same season, in the harder and leaner soil of New England, would have been destructive to the crop.

5. *The improvement of modes and instruments, culture, seeds, and manures*, has been so steadily advancing, that it would be improper to disregard the influence of such an element in forming the estimate of agricultural production in our country. These are not merely afforded by original inventions and discoveries, but former ones are also further extended, by means of the increased disposition to become acquainted with them, which seems yearly to be manifested among the farmers of our country.

It cannot be expected that all new varieties of seeds presented to the public should be equally successful when brought to the test; but enough are proved to render this subject one of great interest to the agricultural community. The trial of new implements is becoming more thorough; and, however adventitious causes may operate to give a temporary success to some that are less deserving, yet the practical test soon places them in their true position. Any attempts at imposition will, sooner or later, be detected and exposed before a discerning public.

In addition to the remarks made in the report of last year, on the causes which operate to promote the improvement of agriculture in the United States, the highly beneficial effects of agricultural conventions, for the discussion of subjects connected with the agriculture of our country, deserve particular notice. These, sometimes existing also under the name of *farmers' clubs*, are doing much to disseminate useful information. They are an advance on the agricultural societies, as they allow a more full examination of the subjects proposed, and elicit much valuable information. The number of them, as well as of agricultural papers and books, is greatly increasing. Nearly every State in the Union has now its agricultural monthly or weekly paper, and in some of the States there are as many as three or four. Volumes of great merit on the subjects of agricultural industry, also, have been published during the past year; and the results of the experiments of foreign agriculturists are now becoming more easily accessible to the farmers of our country. Science has already conferred immense benefits on this portion of our people. Many are unaware of the great things which may be expected from the advance of knowledge in these respects among us. A fact or two may, therefore, be suitably mentioned. By the aid of chemistry, it is asserted that the wheat-growers of France have succeeded in doubling the product of wheat in that kingdom, and now annually harvest more wheat than is grown in Great Britain and the United States. Science, too, has enabled the agriculturists of England not only to cut twice as much hay from an acre of land now, as they did twenty-five years ago, but to keep twice as many cattle, sheep, and swine on the same amount of food as they did; and, of course, to make twice as much beef, mutton, and tallow, wool, butter, and cheese, from any given amount of vegetable food.

The celebrated Lavoisier is said to have cultivated 240 acres of land in La Vendée on chemical principles, and was so successful that he obtained a third of a crop more than by the usual method, and in nine years his produce was double. This, too, was many years since, when the researches which have been recently made, and the vast amount of results furnished by accurate investigations, were unknown. The effect of science, in its application to agriculture, is to furnish correct principles on which the farmer may proceed in the management of his farm, and to remove difficulties which may be more or less expected from the seasons, and a variety of adverse causes. Soils are so differently composed, that general rules cannot always be resorted to for their management; what is well adapted to one crop, manure, or mode of culture, is not equally so to another. Let the farmer understand (as he may easily do) the elements which enter into the composition of the soils and the manures which he employs; and how often may he save himself from disappointment, to which he would otherwise be exposed. The same remark may be extended also to the operation of scientific knowledge in preventing the diseases to which various products

are liable; and the means of culture peculiarly appropriate for particular circumstances, with substitutes for the usual food, and the amount for consumption needed. The diffusion of such information, by the means of agricultural societies and journals, with the encouragement given to improvement, has very greatly affected the appearance of the farms, stocks, and dairies of those by whom the suggestions made have been most practised. A decisive example of this is the following: Under the immediate influence of the Highland Agricultural Society in Scotland, wheat has averaged 51 bushels to the acre, where but little was formerly grown.

The publication of such results, together with the success of similar experiments in our own country, must have a powerful influence in dissipating the prejudice which has been so great against what is called "book farming." It is a matter of congratulation that the different State Governments are becoming more sensible of the claim which the agricultural class have upon them; and that the geological and other investigations ordered by the legislatures, as well as the bounties held out, either directly or by the aid given to agricultural societies, are becoming more general. The talent of the scientific should be encouraged to contribute new information, that our country may be put in possession of the best systems of agricultural improvement, with the best means of using them. Money, thus generously expended, always gives a quick and abundant return.

It may not be improper to mention here, the visit to Europe of one of the most distinguished scientific and practical agriculturists of this country—Rev. Henry Colman, formerly employed by the State of Massachusetts to conduct their yearly agricultural survey of the commonwealth. Much benefit is anticipated from the valuable information he will be able to lay before the public, gathered from his personal inspection of the modes of tillage and improvements in Great Britain and the various countries of the continent.

In compiling the present statistics of the crops, some advantages have been enjoyed for a nearer approach to accuracy, with respect to particular crops, than was the case in the former reports. Together with a minute and extended examination of the agricultural papers, and other sources of information, the aid of the members of Congress has usually been afforded to assist in estimating the crops in their particular districts. These opinions, compared with the intelligence otherwise obtained, furnish means for a more particular estimate than might be practicable without them. In the former year, (1842,) it will be recollected, that, owing to the protracted session of Congress, reaching to September, the members of the national legislature were absent from their homes during the season of the harvest and the gathering of the products, so that they could hardly be expected to have as full and accurate knowledge on these subjects as if they had seen the growing crops, and heard the daily reports of their progress and success.

The ample information now furnished from this source, for which both the Commissioner of Patents and the public in general are so highly indebted, is derived from those who are able to speak more decisively respecting the amount of products, and causes of variations which have been observed the past year; for they who have imparted this knowledge are generally fresh from the midst of the farming and planting communities, who have already decided on the comparative success of their labors during the last and former years. Single exceptions, however, may properly be made, re-

specting one or two crops. Nearly all the crops have been gathered at so early a date, that full and settled information may be had as to them; besides, there are no strong influences which can be supposed to operate to prevent a fair estimate. In the case of the cotton and sugar crops, however, the means of this accuracy are less at command; the crop of either is scarcely prepared for the market in time for one to be able to judge with equal certainty; and the causes which may operate to blind the public, arising from the state of the markets, are of weighty influence. The state of the market will always have some tendency to modify the accounts given in the public journals, and, perhaps, insensibly influence private opinions. These remarks are here made, because it is apprehended that there may be more difficulty of approximating to accuracy, and more probability of mistake in regard to these two crops than any other. With most of the products, however, the estimates are believed to be sufficiently accurate for practical deductions; though they doubtless admit of much improvement by a system of more extended investigation. In this respect, our country is far behind many others, and already we see in Canada indications that a board of agriculture, similar to that formerly in England, is urged on the public. Let any one examine the yearly volumes published in England or France, giving accurate accounts of the crops reported to be raised, with the amount consumed, and various other tabular estimates, and he will be astonished at the labor bestowed in aid of this branch of industry. Nothing but a conviction of its importance, and a determination to learn what our resources are, is needed to enable us to present equally minute and accurate results.

THE SEASON.

Taken as a whole, through the planting, growing, and harvest periods, the season has not been so favorable the past year as in the previous one. The autumn of 1842, especially during the latter part of the month of September and of October, was very rainy; and the sowing of the winter grain was, no doubt, very considerably affected by this cause. The winter of 1842–'3 was a severe and protracted one. There was scarcely any spring, but frosts and cold weather continued in many parts even into June. The snow, which fell in many sections of the country in large quantities, was so covered over with crust, and lay so long, that the grain became thoroughly winter-killed. The cold rains of the planting season for corn, too, delayed it some days or weeks. This variation of the weather was succeeded almost at once by burning heat, and the soil became baked and parched by a severe drought, without the benefit of rain. This lasted through the month of July and part of August, and the corn and potatoes suffered greatly by these alternations of the season. There were likewise unusual rains and early frosts after this long dry period, reaching over the usual time of harvesting of some of the most important crops. On the whole, therefore, the season has been such that the crops have greatly suffered. The extent of the rains and drought has been unusual. We seldom find complaints of these causes so general throughout the country as during the past year.

The ravages of insects have not been as injurious as in some former years; and notwithstanding the diminution of some of the important crops from the causes above mentioned, still, in the varieties of products, there is a sufficiency for domestic use, with a considerable surplus for exportation,

A resort to other modes of feeding the farmers' stock, and a more strict and healthful economy, with a prudent alternation of the articles employed, may do much to make a short crop suffice, even of the usual fodder. In many countries, much attention is paid to this subject, and the proportions of nutriment given in the various grains or roots used, with the right distribution of the same, is made the object of no little care by the farmer. Nothing is wasted which can be profitably employed.

The season was favorable to grass and hay, and large quantities have been stored; so that the deficiency of grain will probably be more than supplied. A kind Providence has thus furnished our country with resources for the various exigencies which may occur in the fluctuations of the seasons and the demands made upon our harvests from a foreign market; and we have little or no reason to fear that we shall ever probably be without enough for domestic use, with a surplus for export, wherever a market may be opened to the enterprise of our agriculturists.

WHEAT.

The crop of wheat is comparatively less this year than the last. The grain, however, generally, is of much finer quality, as it was less injured by rust and the fly. The amount sown was large—more, indeed, than before. The amount raised, therefore, though not so great as would have been the case had the season been favorable, yet exhibits not so material a falling off from the numbers given in the table of the report for 1842, as only an ordinary seeding would have shown. The decrease from the season has taken place, indeed, in the largest wheat-growing districts; but these are likewise the same where usually the assignment of more and rich lands for this crop has been made. In entering into more detail respecting the various parts of the country, the estimates in regard to this most important crop, as well as the others, refer, by way of comparison, to the tabular estimate of the report for 1842.

The New England States exhibit, in the tabular estimate, a considerable amount of wheat as raised; and yet the impression of most of the persons consulted respecting this crop, is, that "but little is raised in this section of our country." The reason undoubtedly is, that it here is a small crop compared to many others; and that, being raised mostly in small patches of not more than two or three acres, there is nothing striking in its appearance to a casual observer. In Maine, the wheat crop is about 30 per cent. less than during the last year. This refers to spring wheat, as, owing to the high northern latitude of this State, there is but little or any other wheat sown. The estimates in different parts of the State range from 25 to 30 per cent. deficiency. The causes of this falling off are various—"the ravages of a worm at the root," "blight and rust," "wet seed-time in the first part of the season, and then the dry weather caused it to bake or grow hard, so that it grew rapidly at first; and then succeeded the damp and wet, which caused a rust and mildew."

In New Hampshire, the season in some parts of the State seems to have been more favorable, and the crop increased. A good judge on this subject says: "More sowed, but 10 per cent. deficit on account of rust." On the whole, the crop will not vary greatly from that of last year. The yield in Massachusetts was probably about 10 per cent. less than in 1842; "the kernel, however, is generally good, and the straw bright." There was probably

considerably less sown, as there becomes every year less and less inducement to cultivate wheat there, owing to the immense crops of the west. A similar remark, as to the amount of the crop, and the cause of decrease, will apply to Rhode Island and Connecticut. The wheat crop of Vermont seems to have been about 10 per cent. larger than the usual average. The spring, however, was cold and backward. "The lake was crossed at Burlington, where it is 9 miles wide, on foot, as late as the 25th of April." The latter part of the spring and the early part of summer was extremely wet, and this was followed by a long drought. The absence of a warm sun is said to be useful, in countries where the soil is not so rich, for producing a full berry to the grain; as it would be liable, on account of slow growth, otherwise to parch up.

The wheat crop of New York, though large, is said to have diminished very sensibly for the last ten years. The western part of the State affords the greatest quantity of this product. In tracing its progress from spring to harvesting, it appears to have suffered various fluctuations: thus, early in the month of June, it is said, "some pieces look well, and promise an average yield; in other parts, it is rather slim, owing to the *severe winter.* It is believed that it will be far short of an average crop;" and in some counties, "not more than half an average crop will be realized." Again: it is observed that "the dry cold weather of May was very unfavorable to it, and that it is so backward, in some cases, that noxious weeds have taken possession of the ground. In Ontario county, many farmers have ploughed over their fields for other crops. The wheat sowed last fall, before the rainy season of September, will probably yield moderately; but much that was sowed after that wet period is of a thin and sickly growth, and promises hardly enough to pay for harvesting." In July, it is stated, that the wheat crop of western New York, "greatly improved the last two weeks of June." The danger apprehended then, was "its liability to rust if the weather should prove warm and moist just before the harvest-time." The month of July proved to be fine weather, and the wheat crop is said to be so good "in quality, though deficient in quantity, that all take courage." In the eastern part of the State, however, during this month, there was injury from drought, as well as from the weevil, which is described as causing considerable waste of winter wheat.

Some time after harvest, one agricultural journal, describing the crop in western New York, says: "Winter wheat was somewhat winter killed, and smothered by the uncommon quantity of snow; but it revived beyond expectation, and, with a light straw and unpromising yield, has far exceeded expectation. The crop is a full average one, and the size and plumpness and quality of the grain never were better." Another and very good authority makes the following remarks:

"The wheat crop in western New York is not an average one; the quality is good, or would be if freed from its impurities; there is more smut, cockle, and chess, than common. There are two causes for an increased quantity of smut: first, last year most of the wheat was cut very green—too much so for seed; secondly, the heavy rains about the time of seeding left the ground too wet for seeding, and much wheat was sown before the land was suitably dry. There is more cockle and chess, for the wheat was considerably thinned by the winter, which gave them a fair chance."

The particular notices from various parts of this extensive region with the usual occasional diversities, correspond to the general statement. In Catta-

raugus and Chatauque counties, though but little comparatively is raised, it is described as "remarkably good." In Erie county, "the difference between the the two seasons (1842 and 1843) is small." Of Niagara and Orleans counties it is said that "the summer of 1842 was wet and rainy. Last summer, however, was unusually dry, which operated favorably on the wheat. The quantity did not exceed the usual average, and in many instances was considerably below it; but the quality is regarded as superior to that of any crop for the previous ten years." In Steuben and Allegheny counties it is estimated to be perhaps "15 per cent. better," as there was a "better season for wheat." In Monroe and Livingston counties, and vicinity, "the yield was about as in 1842, though not equal per acre; but as there was more ground cultivated, the whole product was as large; the straw was light, but the grain fine; the crop was not even, as some pieces were very poor, owing to heavy rains about the time of sowing." As to Onondaga county, it is affirmed that the "quality is much better than last year, and quantity larger—perhaps about 15 per cent." There was not so much suffering there for want of rain, as in some other parts of the State. A more than an average crop, and of a very superior quality, is also attributed to Cayuga and Cortlandt counties. In Tompkins, Chenango, and Yates counties, the wheat crop was "below an average yield in quantity, but of the finest quality. It was partially winter killed, and stood very thin; the heads were long and well filled, and the grain plump and large, and harvested in good order. Last year the crop was much shrunk, and, although it would probably measure more, it would weigh, it is thought, less than the crop of this year." The crop was unquestionably better in the whole central part of the State. In Herkimer and Montgomery counties there was much more seed sown, and the insect was not so destructive. In Oswego and Madison "an average crop." In the northern part of the State there was a considerable increase over the last year's crop. The season is said to have been good for wheat, "owing to the almost entire disappearance of the weevil, and the absence of rust; both of which causes have injured the wheat crop for four or five years past." In the eastern section, and on the river counties, there was likewise considerable diversity in the yield. Of Scoharie and Otsego counties, it is said that "the crop was about as last year; but, owing to the weather about harvest-time, a great deal of grain was injured, if not entirely spoiled." In Orange and Sullivan counties it is said, on high authority, to have been "15 per cent. more, and of better quality. The season has been favorable, and an increased quantity is believed to have been sown." Greene and Columbia counties yielded a moderate crop. Dutchess and Putnam are estimated at 10 per cent. advance. One well qualified to judge remarks, of the vicinity of New York city, that the wheat is "a full average yield—scarcely less, perhaps, than the great crop of last year. It was smothered some by the deep snows, and suffered more or less from being winter killed; but it recovered itself, and produced beyond expectation. There has been but little loss from the fly and rust this year. There was some appearance of these in parts of Long Island, but throughout the whole State there seems to have been but little injury sustained by insects or the diseases from which this crop has suffered in former years." Another, speaking of Long Island, says that the wheat was "an average crop—about 16 bushels to the acre; in some places, injured by the rust and smut."

On a review of the whole State, and from the various information collected

it is believed that the increase for the year 1843 cannot have been far from about 10 per cent. above the year 1842, though the grain is undoubtedly much finer in quality than it then was. As a cause for the comparative decrease of this crop in the last 10 years in western New York, it may be observed that the farmers have gone on cropping their fields without restoring to them, by manure, the means of nourishment removed; and thus their former remarkable fertility has been greatly destroyed. It is said, by one competent to judge, that 40-acre fields have yielded to the husbandman $62\frac{1}{2}$ bushels per acre, of excellent wheat." An example of this is found in a volume of the New York State Agricultural Transactions. The loss thus sustained by this partial exhaustion of the fertility of the wheat lands of this State, is stated to be many millions, and yet the expense of renovation is asserted to be but small. Choosing out the most suitable manures, among which are wood, ashes, lime, and charcoal, the elements taken away may be easily restored.

The attention of farmers has of late been somewhat more roused to consider the subject, and the evil may thus, ere long, by proper care, be remedied.

In New Jersey there has been an increase of 8 or 10 per cent., and the grain is "of an excellent quality."

Pennsylvania, which ranks one of the highest of the Atlantic wheat-growing States, has probably yielded a crop 10 per cent. in advance of last year. The prospects in some parts of this State, early in the season, as gathered from the agricultural papers under the dates of that period, was quite favorable, but in others unfavorable. In the month of June it is said, respecting this point, in Chester county, "the winter grain generally looks well, and gives reasonable expectation of a full average crop." In Lancaster county, "the prospects of wheat are very flattering, and the crops never looked better." Of Berks county, "the fields give every indication of a plenteous harvest." In Bucks county, "a prospect of a good crop, notwithstanding a drought of some weeks' duration." It will be recollected that, in 1842, in this part of the State, the wheat crop suffered from fly, rust, and smut. The western part of Pennsylvania is said, in the latter part of June, to have been suffering from the former of these causes, and the crop is thought to have "fallen off 25 per cent., or more."

The notices of the crop, when actually gathered, prove that the estimate fixed on is probably nearly correct. The following are some of the notices in the public journals: Of Berks county it is said, "the wheat crop has been good in Exeter and Obey, two of our best wheat-growing townships; it does not come far short of last year's yield." Of Schuylkill county, "the wheat in this portion of the county is nearly all secured, and, from what we can learn, will yield a fair and average crop." Of Mifflin county, "our farmers are pretty well through the grain harvest, which has been unusually late. There is not so much straw as there was last year, but the head is better filled, and the grain is fuller and heavier." Of Indiana county, "we hear of a great deal of smut among the wheat." Of Luzerne county, "our farmers are in the midst of their harvest. There is every prospect of a fair average yield; the heads of the wheat are remarkably well filled, and the berry is plump and round." One well qualified to form an opinion says, "on the eastern side of the Allegany mountains the quality was fine, and the quantity as large as last year." In the central counties of the State, in some parts it is estimated as "fully equal,"

in others, "10 per cent. more;" the winter and spring having been more favorable; east of the Susquehanna river, "10 per cent. less, owing to the drought." In the eastern counties "an average crop—equal to last year." Of Lancaster county, another report in an agricultural journal is, "The wheat crop is housed in better time and shorter order than usual; but the crop is decidedly short. The yield will be about two thirds of last year—one-fifth short of average. The failure is in the thinness of the crop while standing, and in the lightness of the grain in the half bushels—the defect caused by the mildew, which has been general all over the country, attacking all the late-sown fields. It is also considerably smutted. The Mediterranean wheat has done better than all other this year. The bearded wheats have been less injured by smut, mildew, and freezing out, than the smooth sorts." The same view is expressed, respecting this crop, in the northern counties. Little or no complaint is, however, made of rust. As the crop of the year 1842 suffered so severely, it is deemed that an average crop would be fully an advance of 10 per cent. for the State on that estimate, notwithstanding the falling off in the western part of the State. The amount raised in Delaware is so small, that it slightly affects the whole aggregate of this crop. The information varies. In some cases it is said "that it is below the average—not so abundant as last year, but of a better quality; and yet, again, its advance has been estimated as high as 25 per cent., especially of Mediterranean wheat." On the whole, it is judged to have been but little different from that of the former year, though, as its quality is better, it will prove of greater value when applied to use.

Maryland, in proportion to the population of the State, yields a large crop of wheat. The notices of this crop, previous to the harvest, describe it in some cases as suffering from the fly, and also especially from the severe weather of the fall of 1842. Thus a journal on the eastern shore records, under date of May 20th, "The old destroyer, the Hessian fly, has made its appearance, and is doing considerable injury. A great quantity has been winter killed, and, owing to the unparalleled drought last autumn, a good deal more has never vegetated." Yet another, speaking of the county of Queen Ann, early in the summer, says, "The fly is committing great havoc in the wheat-fields." The frosts of March are likewise said to have caused injury to the wheat-fields of the eastern shore. In the large counties, too, of Frederick and Allegany, the wheat is said to be "very indifferent." During and after the harvest it is mentioned of Talbot county, on the eastern shore, that the wheat has turned out better than was expected; and in the county of Queen Ann, "the wheat on good lands promises an abundant harvest, while that on poor lands looks remarkably well; it will weigh heavy." Another account also says, "Our farmers who have got out their wheat, say that the grain is very plump, but that the straw yields a light crop. An average crop of wheat has not been raised on the eastern shore: that is certain." Of Frederick county it is said, "There is much complaint of rust, the harvest being late." In Carroll county, "Not more than half a crop; both rust and smut have injured it." In Washington county the crop appears to have been more successful, as it is said, "Notwithstanding the unfavorable prospects of spring, &c., we are confident that the aggregate quantity of wheat for the present year, in old Washington county, will nearly equal that of last year." Of the lower part of the western shore of the State, the information derived is, that, "though the fly was very injurious the early part of the season, the grain has turned out better than usual; the quantity made,

however, cannot be considered much more than an average crop, though the quality is very good." In some other sections, "The wheat crop has been estimated as much as one-third greater in quantity, and also in quality, than last year—some partial injury by the weevil being the only defect in the quality; whereas, in 1842, the whole crop was very materially injured by the rust, by which the quantity was greatly diminished, and the quality very essentially impaired." On the whole, in view of the injury sustained in the crops of 1842, there appears to have been an advance, taking the State throughout, of about 15 to 20 per cent. on the crop of that year.

The crop of 1842, in Virginia, was very much injured (as will be seen on referring to the report for that year) by rust and heavy rains. Taking the State through, for the year 1843 the crop has been much better, though in some sections it has suffered from the fly. The ill-boding anticipations of the earlier period happily were not realized. In the middle of June, a person passing through the great wheat-growing valley of Virginia, says that "there is a very great failure;" which is attributed to various causes—as "the Hessian fly, severe weather early last fall," &c. In a public journal in Rockingham county, of a later date, we find it stated: "The wheat crop in this county has greatly improved in appearance within a few weeks past." The same remark is also made as "true, to a good extent, in regard to the crop in Frederick and the adjoining counties." Other notices, like the following, are likewise found in the public journals during the month of July: "In lower Virginia, the wheat is nearly all housed, and the crop is a good one." "In western Virginia, the wheat crop is among the best that has been raised for many years." "The wheat crop of western Virginia, from all accounts we have seen and heard, may be reckoned as among the best, if not the very best, this year, that have been raised for many years." The particular information also obtained otherwise, with respect to different portions of the State, is somewhat various. Thus, the intelligence respecting the crop of the northeastern section, including the counties from Loudoun to Culpepper and Stafford, is: "The wheat crop is inferior to that of 1842." The cause of the inferiority given, is "the wet season, accompanied by rust, which destroyed the crop after it was almost matured. The growth of straw of 1843 was much better than that of 1842; and, until within a few days of harvest, the promise was of more abundant crop than had been enjoyed for many years." From another source of information of high authority, we learn, respecting the crop of the tide-water country between the Rappahannock and Potomac rivers, that there was no material difference between the crops of 1843 and 1842. That of the latter was "a very poor one, both as to quantity and quality, owing to a succession of wet weather when it was in the blossom state, and while the grain was forming. The crop of 1843, though of better quality, was quite as deficient as to quantity. Its failure as to produce was the result of the most unfavorable seed-time within my recollection, owing to the absence of rain from some time in September till late in November of 1842. Much, very much of the seed, never came up; and what did, was in too tender a state to survive the rigor of such a winter as the last, without considerable injury." In the tract of country lying within the limits and vicinity of Amelia, Prince Edward, and Campbell counties, it is said that "wheat has proved of good quality, but the quantity very deficient—below an average—being seriously injured by the rust." In the counties ranging from Spottsylvania to Middlesex, west of the Rappahannock river, the

wheat crop is stated to have been "better in quality, and about 20 per cent. greater in yield, than the last." Similar information has been received respecting this crop in the southeastern counties of the State, which suffered so severely the last year by the floods; and the increase in 1843, as compared with 1842, is variously estimated from twenty to thirty or fifty per cent. The average increase of the crop actually harvested for the whole State this year, it is supposed, cannot have been far from twenty per cent.—perhaps exceeded it, as the injury from heavy rains and floods, like those of 1842, did not occur. The application of calcareous manures, and especially the practice of marling, which has been gaining favor lately, has improved the lands of lower Virginia; and although the crop probably falls somewhat short this year, yet the agricultural products are said to be "steadily and progressively advancing." This species of improvement seems peculiarly adapted to that section of country, as the experiments tried very clearly show.

The wheat crop of North Carolina, the past year, is said to be much better than that which was harvested in 1842. This State—especially the upper part of it bordering on Virginia—then suffered from floods, by which the crops were much injured. The notices of the crop for the past year, found in the public journals at the time of harvesting, and information since obtained, are as follows: "The wheat is said to be larger, and of a finer quality than usual." The crop is said to be "more than an average one in quantity, and better than usual in quality." "In the western part of the State, an average crop as good as last year;" and, taking the whole State through, it is estimated that the general average of this crop may be fixed at an increase of twenty-five per cent. A similar advance of twenty-five per cent. may probably be allowed to this crop in South Carolina; as the notices variously obtained indicate a large increase over the crop of 1842. One public journal says: "Beyond doubt, the quantity of breadstuffs and grain will surpass any crop we have had for many years before." In the northwestern and central portions of the State, the estimates, in some cases, reach from thirty-three to fifty per cent. over the crop of 1842, owing to the rust which affected the wheat crop of that year; in others, it is thought that the crop is about the same as in the previous year.

The wheat crop in Georgia is said to have been "very good;" probably it may be a fair estimate to fix it at 10 per cent. advance. That of Alabama is thought to have been "10 per cent. less." As the public journals of these latter-named States seldom take much notice of this crop, (it not being so prominent a one as some others,) it is more difficult to attain to accuracy respecting it, than where resort may be had to agricultural journals, and tracing it through the different periods of its growth.

In Mississippi, according to the information obtained, the variations of the crop were important. The quantity sown is said to have been "considerably greater," and the wheat crop "somewhat better." An agricultural paper in the western part of the State speaks of the crop as being a "very heavy one;" while, from still another source of information in the upper part of the State, we learn that it is "very deficient," and is even represented to be "50 per cent. less than last year," "winter killed," and "affected by rust." The average advance for the whole State, therefore, cannot be far from 15 per cent.

The yield of wheat in Tennessee may be fixed at about 5 per cent. advance on the year 1842, though it varied in different parts of the State.

In the eastern section, it is thought to have reached even to "25 per cent.," and the crop is reported as having been "considerably better" in the southwestern. In the southern central counties, it is said, "In consequence of the hard frosts last winter and spring, the wheat crops were from one-third to one-half less than what would be called a good crop for the country. Though in quantity much below the ordinary crop, the quality of the grain was excellent—rarely, if ever, surpassed in that part of the country." Another estimates the falling off at 10 per cent. for some of the counties in the southwestern part of the State.

As to Kentucky, the editor of an agricultural paper says that the crop was "only a medium one; the frequent changes of the weather during the preceding winter causing it to freeze out." He estimates it at probably "20 per cent. less" for the central section of the State. From another authority we learn, in similar terms, that it was "almost a total failure, from freezing out during the winter." For the southern central part of the State, an estimate of this crop has been made, that it has advanced 25 per cent. In the eastern section, it is said to have been "not better than last year, owing to too much wet." In the six counties west of Tennessee river, we learn that it was "but little, if any, under the average." On the whole, there seems, from the best information obtained, to have been an average falling off of about 10 per cent., on account of the prevalence of the causes above mentioned.

Ohio, as is well known, ranks first of all the States in the production of wheat, and, with ordinary crops, its surplus is a large one. An unusual extent of land was sown in the fall of 1842, and a great increase of the crop was thus anticipated. But the effect of the weather during the winter, and the early spring and summer of last year, was such as in no slight degree to destroy these hopes; and, on the whole, the crop has considerably fallen off. The earlier notices respecting it are various. A journal, published in the Sciota valley, in June, says, "we are glad to learn, from different parts of the country, that the wheat crops this year promise to be more than an average." In the northern part of the State, in some of the finest wheat districts, the rust caused serious injury. In one of the agricultural papers, a correspondent, writing respecting that region, about the middle of July, says, "nearly all the wheat within 50 miles or more, south of Dover, (Cuyahoga county,) is rusted." Another, in Tuscarawas county, writes, "there is no mistake that the rust has struck nearly every field of wheat in the neighborhood." "The plains and bottoms, as far as we hear, are struck with the rust." And again, from Zanesville, this information is given by yet another: "great complaints about the wheat being struck with rust." So from Newark, in Licking county, "there is great complaint about the wheat being injured by the rust, owing to the very heavy dews and hot weather." A Chilicothe journal says "the wheat has improved very materially within the last few weeks, but there is no expectation of anything like an average crop."

After the harvest, however, the discouraging aspect which had given rise to such fears, was found not to have been fully realized, though the crop was not a large one in view of the amount sown. An agricultural paper at this period remarks of the wheat crop south of Columbus, that "the berry is plump and good," but adds, "the crop is not an average one." A Cincinnati journal likewise says, "our farmers in the Miami valley have already begun to harvest, and the crops are turning out much heavier than was anticipated. Although the wheat stands thin on the

ground, the heads are extremely well filled, and the kernels plump and better than last year. There was, besides, a great increase in the number of acres put down to wheat last fall, and, in the opinion of disinterested judges, the crop even in the southern part of Ohio, where the greatest deficiency was feared, will turn out vastly better than was expected six months ago." A similar diversity prevails in the information obtained of a later date, from other sources. A good judge, speaking of the crop in the vicinity of Dayton, says, that "there is a greater crop this year than the last, in Montgomery county, by at least one-third. This refers only to the product per acre. A much larger crop was put in, as is usual after a scanty crop—probably one-sixth more; making, in the whole, one-half. In my own opinion, the best reason for the increase is less fly and rust. I disbelieve the benefits usually imputed to our last winter's season. It was a double crust of ice of some six weeks standing. I examined my own, and found the stalks yellow and dry; and when the snow melted, none of our fields came out with that greenness and strength which usually follow a snow, affording moisture, and yet air." Another says of the southern counties in the northern slope west of the Cuyahoga, which grows the best wheat in Ohio, "the crop of wheat has been, at least, an average one; and my opinion is, that, from the additional quantity of land put under cultivation, it will range from 10 to 15 per cent. above the crop of last year. The portions of the State between the summit counties and the Cumberland road will be deficient 15 per cent., and that portion south of the Cumberland road at least 20 per cent. Taking the whole State together, I am inclined to think there is a deficiency under that of last year, of at least 15 per cent." This view would seem to be justified by other information. In the southwestern part of the State, it is said, "there is a deficiency of one-third, compared with last year." In the southeastern section, including the counties lying around Muskingum county, the information obtained is, "25 per cent. less than last year." The cause of failure was, "the season; a part of the spring was favorable, except, perhaps, it was too wet; and then a long drought followed, which threatened its destruction. A few very excessively wet days caused rust, which injured its quality very much." Of the northwestern section, it is said, "less by 25 per cent., in consequence of heavy rains in the spring." In the Sciota valley, we learn it was "thought to be an inferior crop this year, both as it regards quantity and quality." Respecting the wheat crop in the northern central section of the State, including Richland, Marion, and Delaware counties, the judgment formed is, that there was "10 per cent. more, as there was an increased quantity sown, and more careful and skillful cultivation." In Holmes county, and the counties adjoining it, it is said to be "about equal in quantity, but 10 per cent. lighter than last year, on account of the dry summer." In the counties of Hancock and Crawford, and those lying north of them, it was "not so good as common, owing to a heavy drought, which commenced last May, and continued till July, without a fall of rain." Of the southeastern section, near the Ohio river, the information obtained is, "the wheat crop of the present year was less to the acre, probably, by one-half, than for many years. But as there were more acres sown than usual, the amount will not be lessened more than 30 per cent. Among the causes of this decrease are—The severe frosts of last winter, which, in many places, almost entirely destroyed the late sown wheat. The spring was not favorable for the advancement in growth of such as remained in the ground;

and the severe drought, that commenced as early as the first of June, prevented its filling well. The harvest was at least two weeks later than usual." Properly to graduate the balance between so many conflicting notices, is no easy matter; but, after the most careful examination, it is believed that the estimate may be fixed at 30 per cent. decrease of this crop from that of 1842.

The early notices from the large wheat-growing State of Indiana were similar to those that have been mentioned above, as to Ohio—unfavorable. Thus, "In the central and southern portions of this State, the January thaw destroyed many pieces. In the northern sections, also, many fields of wheat are entirely destroyed, and others injured." Again: "Wheat has been injured very materially by the winter, and the wheat crop will, probably, be less than an average one." The information obtained from various sources, since the harvest, corresponds well with this statement. In the central part of the State there is said to have been "a light crop—below an average one—though the grain was good and heavy." In the northern section, bordering on the Lake and State of Michigan, it is estimated that there was "a full average crop." Of the extreme southwestern part of the State it is said, "Wheat hardly averaged one-half of the crop of 1842. The cause was the severity of the winter, unaccompanied by snow—the wheat was 'frozen out.' Where a large quantity of seed was put in, it did better. One person, who put in two bushels of seed wheat, had an average of over twenty-five bushels to the acre." In the counties ranging from Knox county to Morgan county, northeasterly, and reaching nearly to the centre of the State, it is judged to have been 35 per cent. less than last year, on account of the alternate freezing and wet weather during last winter and spring. In the southeastern section the crop is said to be "about as good as last year—perhaps a little more sown." The same conclusion is formed respecting the crop on the Ohio river, and forty miles back, from Madison to New Albany. In some four or five counties on the Wabash, in the central western part of the State, it was probably "about an average crop." On the whole, the general average falling-off was, probably, not far from 15 per cent. The same remarks which were made respecting the early notices of the wheat crop in Indiana, apply likewise, in general, to that of Illinois at the same period of the year.

Of the appearance of the crops on the western side of the State, (Illinois,) in May, it is said, "The wheat, though much injured, is not frozen to the extent that was expected. The late rains have been beneficial; and many fields, of which there was little hope, are now quite green." Still lower down it was "winter killed;" and farther to the north, at a somewhat later date, it is said to be "an almost total failure; not one acre in fifty will pay for harvesting." One person, whose means of knowledge entitles his opinion to more than ordinary weight, speaking of this crop after harvest, says, "south of Lake Michigan, there is nine-tenths less; north and west, one-fifth more." Again, another of our informants says of the wheat crop of the State, "In south Illinois it was bad; in the north, good." In the vicinity of Clinton county, so far as can be learned, "the wheat crop is short, owing to the long continued and severe winter. The yield is not half as large as usual." In several counties lying in a direction southeast from the centre of the State, towards the Wabash, the crop was a total failure, owing to the cold winter." In several others in the southwest, bordering on the Mississippi river, the crop of wheat is estimated as having been "25 per cent. better

than the last year." Further north, in a number of counties on the same river, and ranging east, it was "50 per cent. less, owing to the cold winter, wet spring, and dry summer." An informant, speaking of this crop, says: "Last winter there was a succession of freezings and thawings, which froze winter wheat out; or, as the farmers term it, 'spewed it out.' The result was *an entire* failure of one-half of the fields sown in wheat, and yield of less than a fourth of an average crop in those fields which had any wheat at all. This was the case from Peoria south. From that place north, where the snow lay on the ground nearly all the winter, the wheat crop was very fair, and the grain is heavier than usual. Take the State throughout, the wheat is about half an average crop. Much wheat is sown for the ensuing season. This is the first time there was such a failure, and probably it will not occur again in half a century." The falling off through the whole State, it is thought, cannot be estimated at less than 20 or 25 per cent.

The wheat crop of Missouri, also, suffered most severely from the same causes which have already been specified. In May, the information given to an agricultural paper, by a correspondent, was: "The wheat crop is literally killed, and will not give ten bushels to an acre." Similar information comes to us since the harvest. It is said to be "almost an entire failure—hardly enough for seed." The cause of the decrease was the thaw in January, and freezing afterwards. One who is pronounced to be high authority, at a later date, (in July,) says, respecting this State and some others adjoining, "The wheat crop has failed more decidedly and universally in this State (every part of it) than it has ever done before since wheat was sown here; and the same remark will apply to the States of Kentucky and Indiana, all the southern portion of Ohio, three-fourths of Illinois, and the Territory of Iowa. In all the territory embraced in these remarks, little, if any, more than the seed sown will be gathered." In accounting for this failure, he adds: "The wheat was not thrown out of the ground by sudden freezing; the ground was not wet enough for this, during the winter; but the wheat was literally killed by hard freezing. The ground was pretty dry, and the weather clear; and when the sun had acquired sufficient force to thaw the ground every day to the full depth of the wheat plants, it then froze as hard as granite every night, for a great length of time, until nearly all the moisture was evaporated from the surface; the wheat thus perished." It is believed that this estimate of the loss is too great; that it would be a more accurate estimate to fix the decrease on the crop of 1842 at 30 per cent. for that of the crop of 1843. In Arkansas, wheat is said to be beginning to be cultivated to some extent for exportation, and increasing in the amount raised every year. Much more land was devoted to its cultivation the past year than in any previous one. The same extent of ground will yield, it is thought, "one-third short" of the crop of last year; and, in view of the whole balance to be struck, the average for the entire State must, probably, be fixed at about 10 per cent. decrease.

In Michigan, it will be seen, by reference to the report for that year, there was an unusual advance in the wheat crop of 1842. In the prospect of an increasing Canada trade, and the hope of the revival of business generally, much more than usual was laid down to wheat in the fall of that year; and though the grain has not been so large in some parts of the State as was hoped, yet in others the crop has done remarkably well; so that the average advance may probably be fairly estimated at not less than 25 per

cent. On reviewing the early notices of the crop in this State, as they are recorded in the agricultural journals and elsewhere, we gather the following information: In the month of May, it is said, "From every part of the State we receive the most cheering accounts of the prospects of the wheat crop; in the section of Livingston county, they never looked better." Again, an agricultural journal of very respectable character, says: "Notwithstanding the uncommon backwardness of the season, the wheat crop looks exceedingly fine and promising. From present indications, the farms of Michigan may expect a large and unusually abundant harvest. Far more is cultivated in wheat the present year, than at any former period." Again, somewhat later: "It never looked better, or promised a more abundant yield." In June, it is said: "In central Michigan this crop continues to look unusually promising; and accounts from the north, south, east, and west, advise us that the prospect of an abundant harvest is favorable in these sections"—"the prospect is, that the wheat crop of Michigan will be greater than an average one." Similar notices meet us as we advance in the season towards the harvest. Thus in July: "Wheat crops promise well;" "will be over an average." In August: "The wheat crop is abundant, and is being secured in good order, though some fields are a little smutty, and in some places the wheat is a little shrunk from the drought and premature ripening; still, on the whole, the crop is greater than usual." By some, the crop was conjectured at the harvest-time to average twenty bushels to the acre; and mention is made of its having been particularly good in the counties of Lenawee, Washington, and Jackson, as there was much sown there the fall before. Another authority, in the latter part of August, speaking of a particular section of the State, says: "It is predicted that more wheat is raised in the St. Joseph valley this year, than at any previous one. We have been told that in Terre Coupée alone, there will be one hundred and fifty thousand bushels." Again: "Our farmers are in the midst of harvest, and, thus far, the weather has been most propitious. The crop is very good; and, as far as our information has extended, it has not been injured by either insects or the rust." Later intelligence confirms these favorable opinions of the crop. From one source we learn that, "judging by the northeastern section, the crop, taking the whole State together, is greater than last year by at least 10 per cent.," which is undoubtedly too low an estimate. Another gives it in the southeastern section as "one-third larger." The causes of this advance are stated to be improvement in farming, and the greater number of acres cultivated. The two seasons were equally favorable for the crop. The same has been about the increase over the State, and is generally ascribed to the same cause.

The estimated surplus of the State is 3,000,000 of bushels. The above estimate for the whole State is probably somewhat too large. In the southwestern section of the State, it is said "50 per cent. better than last year;" and the reason assigned for such an increase is, that "the winter was generally favorable, on account of the body of snow on the ground all winter; although in some places it was winter killed or smothered; the spring months were wet, and the month of June cool and dry, which is always favorable. July was also dry, and the whole ripened quick, and without rust." Again: another informant, speaking of the crop, says "50 per cent. more," and adds, as a reason, that there was more sown, and the crop greater. He estimates the crop at the average of twenty-four bushels

to the acre. As the large estimates here made probably include an allowance for an increase of population, (which is not taken into consideration in these present remarks on the crops, though embraced in the tabular estimate,) it is behind the general average already given for this State, which, though possibly somewhat too low, is nearer the truth. The Territories of Wisconsin and Iowa are both advancing in the amount of ground brought under cultivation, on account of the influx of population from abroad; and the crop of wheat in the former of these Territories was probably considerably above an average of 10 per cent. or more. In Iowa, "owing to its freezing out," by some it is estimated to have been about 20 per cent. less. "The spring wheat, however, was an excellent average crop." The general average may have been 15 per cent. less than the former year; though the per centage estimate for increase of population much reduces this decrease in the tabular estimate.

The amount of wheat raised in either the Territory of Florida or the District of Columbia is so small, that the mention of it seems hardly necessary. The same causes which affected the crops of Virginia and Maryland, would naturally have an influence on that of the District of Columbia, which adjoins them. The wheat crop of Oregon has been estimated at seventy-five thousand bushels.

From a review of the whole account of the wheat crop, it is believed that it may therefore be fairly estimated, as in the table, at 100,310,856 bushels; which will be about $5\frac{1}{5}$ bushels to every person in the United States, allowing the estimate of population contained in the table.

From the accounts received, and various notices contained in the agricultural journals, it appears that the Mediterranean wheat has again been proved to be not so liable as other kinds of wheat to the attacks of the fly; and by many it is pronounced even entirely free from them. Thus a gentleman (Hon. Mr. Taliaferro) who has tried it for six years in Virginia, and whose testimony has been heretofore given in its favor, says it "has yielded a better crop, both in the last and present years, than any other species of wheat under similar circumstances. The frequent failure of the wheat crop is the result of late seeding; and that is done, he observes, with a view to escape the fall attack of the Hessian fly. As the Mediterranean wheat may be sown as early as the middle of August, without fear of the fly, he adds: "I confidently look to it for a restoration to full and fair crops of wheat. I sowed a parcel of it on the 15th of last August; it now (December, 1843) looks remarkably well, and is so far free from any injury by the fly." Another person (A. S. Tassel) of Vienna, in the State of New York, after his seeing it claimed that it was not subject to be affected by the rust or fly, says: "I concluded to give it a fair trial; and accordingly divided the piece into equal parts, and sowed two bushels of Mediterranean and two of good cleaned western wheat." It was sown on the 23d of September, "the ground being wet and in a bad condition; it came up well, and the two kinds appeared equally well till they were covered with snow. In the spring, though both were much injured, the western was much more killed out than the other; on examining it frequently before cutting, I found that the weevil was considerably at work in the western; but, though standing in immediate contact with it, I did not, in any instance, find one in the Mediterranean, which was also at least two weeks earlier than the western; but, upon cutting, I found that the rust had struck the western, (the other being bright,) so that, though quite green, it was necessary to cut

it at the same time. Upon threshing, there was more than double the quantity of the Mediterranean, (the whole crop was light, being but 15 bushels,) and the berry plump and good. I am, therefore, of opinion that it possesses all the qualities claimed for it; and that it is decidedly preferable to western wheat for this section, as it will produce well, and be a much more sure crop." The editor of the New York Central Farmer also gives his testimony in favor of the Mediterranean wheat, from a similar experiment. He says farther, as the result of inquiry at Philadelphia of a gentleman extensively engaged in the seed business, that in the fall he was told that more wheat of this description was sold there than of all others, and that "more was raised of Mediterranean than of all other varieties, in Pennsylvania, as it uniformly withstood fly and rust far better." One objection brought against this variety of wheat, is its dark color. On this subject Robert L. Wright, of Wheatland, Virginia, in a communication to the American Agriculturist, says: "I have sown it for two seasons; and the change has been so great in the color, as to convince me that, by cultivating it here, it will lose its dark color, and become as good in that respect, and yield as much flour, as any wheat we have. The two seasons I have raised it, it has been the best wheat I had. I have doubts whether it will tiller as much as some other varieties, and therefore sow it much thicker."

Dr. Muse, of Cambridge, on the eastern shore of Maryland, writes respecting the German wheat, (which appears to be the same as the Mediterranean wheat, or a variety of it—both kinds of it having been procured from Delaware;) "My sack of it in 1841 proved to be so perfectly secure in 1842 from fly and frost, when my usual and other kinds in the farm-field were very much injured by both causes—and indeed, too, under similar circumstances—that, learning from a gentleman in Talbot county that he believed he had the same wheat obtained from Delaware, called the Mediterranean, I procured from him 10 bushels, to extend more rapidly my cultivation of it. On the growth of *this*, and of the product from the seed of *my own*, there was, I admit, considerable similarity; yet *mine* (the German) weighed 63 pounds to the bushel, and his only 60. Mine was fit to harvest on the 15th of June, though it was not harvested, owing to rains, till the 17th of June; his was harvested eight days after mine. Mine was distinctly a plumper grain, but not lighter colored than his. These both grew in my field under conditions as like as possible; neither was injured by fly or rust or frost. They were seeded the middle and last of September. I have now a third crop of *mine*, and it is manifestly the most vigorous and luxuriant growth of wheat ever seen, perhaps, in our neighborhood; indeed, all say so.

"You ask, does it stand proof against fly and rust? I answer, in my opinion it does stand proof against fly, rust, and frost. The security against the former enables the grower to seed it the middle of September; and this early and thick *seeding* secures it against the two latter evils. My product the two years above named was more than 50 per cent. above any other wheat; and it offers a fair promise this coming season to double it." In respect to the objection to its being too dark for flour, he says: "The first year that I grew it, I sent a bushel of it the next day after harvesting of it to the mill. The miller returned me 40 pounds of flour, and wrote me it would have made a little more, but that it was too recent and damp for the best possible product. The next year I had 5 bushels manufactured." He says that it produced as good a product; "that it is excellent flour, and

quantity as much as usual." But, on this point, David Hollingsworth, an experimental and large miller near Baltimore, says, on trial, that it makes very good superfine flour, and such as bakers would prefer on account of the water it absorbs, and that "5 bushels will make a barrel." Mr. H. N. Pendleton, of Louisa county, Virginia, a highly respectable farmer there, writes that "the quality of the flour is admirable," and that it is the very best he has ever had ground, and as good "as the best Richmond manufacture." Other notices respecting this species of wheat might be given; but it is now so extensively known, that they are probably unnecessary.

A variety of wheat, called the Black Sea, has been tried in Canada; of which notice is given in the British American Cultivator. It is said that it will yield from 20 to 40 bushels per acre, with a plump berry; though the flour is more harsh, and not so white as usual. It is also stated to be proof against the rust. A species of spring wheat, called the Cape, or Cape of Good Hope, which weighs 65 pounds to the bushel, of a bright transparent amber color, very productive, and capable of producing an excellent quality of flour, is also mentioned in the same journal.

A new variety of wheat, which has been very highly recommended, is the improved flint. Some of this has been obtained from the proprietor, Gen. Harmon, of Wheatland, New York, and distributed to the members of the national legislature and various distinguished agriculturists, by which means it will undoubtedly be tried very extensively hereafter throughout the whole country. Gen. Harmon's account of it is as follows: "The improved flint wheat has been improved from the old flint, by selecting the purest examples, and sowing them on sandy and gravelly limestone land, so that the berry is now larger and whiter, and the bran or hull very thin; the heads are longer; and the straw too is stiffer, and not as subject to lodge as formerly. This is the most valuable variety grown in this section of country. It bears a good yield, producing a beautiful berry, weighing 64 lbs. to the bushel, and producing more superfine flour to the bushel than any other variety I am acquainted with. It is not affected by the Hessian fly as much as many other varieties." The same gentleman has paid very considerable attention to the culture of different varieties, and makes a remark which deserves consideration, "The greatest objection to new varieties from warmer latitudes, is, that they are not hung to stand our winter. I have sown the white May Virginia for five years; the first two years I was pleased with it; since then, it has been failing; it has not withstood the winters well, and the heads are growing shorter, and the berry more red." He also thus speaks of his mode of culture: "Thirty years ago we were in the habit of ploughing in the most of our wheat on smooth land; we used the common two-horse plough; but we became satisfied that some of the seed was covered too deep; the plough was given up, and the harrow has been used since. A few years since, I built me a three-cornered harrow, and, instead of teeth, I put in the common cultivator teeth, which I have used on my summer fallows and for covering my wheat; the last time in going over it, I go north and south. This leaves the land a little ridgy and protected from the cold northwest winds, which are severe here in the month of March after the snow is off; when the roller is used after the harrow, it has been more killed out; and when the soil is made very fine, it is more liable to be winter killed. The common horse ploughs bury the seed too deep; the lately constructed quadruple plough answers very well."

A singular species of wheat is mentioned by Mr. J. H. Lyman in a late number of the American Agriculturist, called the wheat of Taos. He says that it is found only in New Mexico. The peculiarity of it consists in the plurality of heads, or ears, differing from our common wheat-heads only in size, being a trifle shorter and thicker, but equally well filled out. The berry is quite as large, and the flour as white and good, as of the wheat cultivated in this country. The stalk also is stronger and thicker, and but a very few inches shorter. About 8 inches below the top, and immediately above a joint, a small seed-stalk is sent out 2 or 3 inches long, terminating in a head or ear. At a proportional distance (say 1½ inch) above the first seed stalk, another is sent out in the same manner as the first, and so on continuously for six heads—the main stalk or straw terminating also in a head like the common variety. It produces, in all, seven heads or ears of the same size and character. It is called by the Mexicans the *seven-headed wheat.* I am satisfied that it produces much larger crops than other wheat, and that it is well worthy of a trial by our American farmers. He says that the seed could probably be procured of Mr. George Gold, through Mr. John Scully of Santa Fe.

As the result of some experiments respecting grain of different kinds—wheat, rye, barley, and oats—in Germany, it is said that "from two-thirds to three-fourths of the grain-plants had their root-stalk only one inch under ground, and exactly these produced the most stalks; one-fourth of them had their roots only 1½ inch deep, and had only half as many stalks as the first; at 2 inches deep, there were only 4 in 100; and at 2½ inches deep, only 9 in 1,000; but only one of them produced stalks, while in the first rye and wheat showed only 2⅗ to 4⅕ stalks. Winter wheat at 1 inch gave 765 root-stalks out of 1,000 as remaining in the earth, of which 3⁴⁄₇ produced stalks; at 1 to 1½ inch, of 1,000, gave 215 root-stalks, of which 2⅛ produced stalks; at 2 inches, only 17 root stalks of 1,000, of which only 1 produced stalks. From this, it is clear that shallow sowing, if the seed is only so far covered as to sprout, and the germ is protected from immediate contact with the air, is preferable to laying the seed deep, because it springs up quicker, and acquires a stronger growth, and has hardier plants." "The climate and period of sowing, as well as the weather, will of course be considered in determining the depth. The warmer, dryer, and especially the more windy the climate, the deeper (other things being equal) the seed must be laid. Wet and cold weather requires a shallow sowing; a dry and hot season a deeper burying up of the seed." "A *shallow* sowing is one which covers up the seed only half an inch thick; a *moderately deep* sowing, 1½ inch thick; and if from 1½ inch to 3 inches in depth, it is called *deep sowing.*" The choice of seed is very important; and the remark may be repeated here, made in the last report, that the grain which is most suitable for nutritious bread, on account of containing the largest portion of gluten, is not the best for the seed. The neglect to observe this may have sometimes contributed to influence the crop. It is also well ascertained that grain threshed by threshing machines yields seed far less suitable, on account of its being broken, than that threshed by the hand-flail. The amount thus obtained too from the sheaf is supposed to be one third less.

Of the constituent elements in the grain and straw, in the natural state of a fertile soil, there is usually a sufficient quantity for their production. This was originally the case with the soil of New England, but the mode of cropping pursued has exhausted some of the constituents so as to destroy

its suitableness for this product; the straw produced in wheat is estimated to vary from 2 to $3\frac{1}{2}$ times the weight of the grain. Now the materials so abstracted must be supplied by various manures which contain them. A gentleman of high character as a scientific agriculturist remarks on this subject: "The use of wood-ashes, lime, and charcoal, has done wonders in the way of producing large crops of wheat. Slacked lime frequently applied to fields that abound in fragments of limestone rocks, has been found highly serviceable to wheat and other crops. The necessity for the frequent application of small quantities of lime seems to be owing to the circumstance, that immediately after the carbonic acid has been extracted from the alkaline base, the latter is soluble in water, and hence liable to be washed away into rivulets, and to pass with that element deep into the earth, beyond the roots of the needy plants. Water that has passed through a soil containing lime, holds it in solution, which may be precipitated by carbonic acid. The power of production by proper manure is very remarkable. By feeding the wheat-plant with what it will take up, it would seem as if the crops might be increased to almost any extent. Lord Hardwicke stated, in a speech before the Royal Agricultural Society of England, that fine Suffolk wheat had produced 76 bushels per acre, and another and more improved variety had yielded the astonishing quantity of 82 bushels per acre." A writer on this subject in our country, says: "We have been shown a stool of wheat originating from a single seed, the growth of the present season, with 30 stalks averaging from 100 to 110 grains on each head. Over 3,000 grains is thus the product of a single plant in one season. Mr. A. Palmer, of Cheam, in Surry, England, tried a very striking experiment respecting the production of wheat. In July, 1841, he put one grain of wheat into a common garden-pot. In August he divided it into 4 plants, and in 3 weeks again divided these into 12 plants. In September, these 12 were divided into 32, which in November were divided into 50, and he then placed them in the open ground. In July of 1842, 12 of them had failed, but the remaining 38 were healthy. On the 19th of August they were cut down and counted 1,972 stems, with an average of 50 grains to a stem—giving thus the increase of 98,600 grains. This would seem to show that transplanting might in some cases be resorted to with advantage."

The average of the wheat crop in England is computed at 26 bushels per acre; in this country, a good judge says, "we question much whether it will reach to more than 15, or 20 at the farthest." The time of seeding is thought to have a very material influence on the prosperity of the crop; and the impression seems to be quite general among some of our best agricultural writers, that the sowing of this crop is usually delayed too long. The advantage of a change in this respect would be to allow the plant to become rooted early enough to withstand the freezing of the ground, and thus also to be less affected by the thaws and freezings of the winter.

Two evils have been stated as objections against the early sowing—the Hessian fly; and the lodging of the grain, by premature growth of the head, while the stalk is not strong enough to bear the weight. It is suggested, however, that the autumnal attack of the Hessian fly may be prevented by rolling the field with a heavy roller, and thus destroying the insect in a worm state. The practice has been found, on trial, to be very useful, and comes well recommended. The objection to rankness, or its lodging, it is stated, may be obviated by turning in a flock of sheep to eat it down in dry weather in the early spring; it is added, that this will not injure, but bene-

fit the crop, as the manure of sheep is well adapted to wheat. It is estimated by a writer whose means of judgment are not ordinary, that the wheat crop of this country is lessened by what is called winter-killing, at least one-third below what it might be otherwise; and that this loss is also mainly owing to the practice of late sowing. The proper time for sowing wheat, or any other grain, must depend on the latitude and general climate; but it is thought that in almost all cases there would be an advantage in sowing wheat at least two or three weeks earlier than usual. Late sowing is not merely otherwise not so beneficial, but it also interferes more in the preparation of the land, with the general business, and the gathering of other crops, and is therefore most expensive.

The amount of seed to be sown is also a question which is still under discussion; and some of our best writers incline to the opinion that commonly there is not enough seed used. It is important that enough be sown to supply a sufficiency of wheat-plants to occupy the ground and keep down the weeds; for if this be not done, they spring up and rob the earth of fertility and lessen the product. One good writer, after mature consideration of the question, fixes on two bushels to the acre as about the right quantity. The English practice is two and a quarter to three and a half bushels broad cast; two to three bushels drill; one and a half to two bushels when dibbled. The same amount is stated by European writers to be the average in Germany.

The *selection of proper seed* is also a subject of much importance. It is said in an English journal, that seed wheat should be picked by hand, in order to secure it in the best order. The suggestion deserves consideration. The following method is recommended in the selection of seed wheat: to take six bushels of good quality, and use a large sieve, that five bushels of the six can pass though it. The bushel that remains will be the largest kennels and should be retained for seed. This experiment has been tried with good success in some parts of our country. In one case, sunning the wheat for 15 days before sowing, and then passing it through a sieve, as above mentioned, is said to have been used effectually against the Hessian fly during 15 years' trial.

An able writer in the Journal of the Royal Agricultural Society of England, in relation to the subject just mentioned, gives the following directions: "In making a comparative trial with varieties of wheat, it is necessary to select a portion of land uniform in texture, subsoil, and expense, and which for years has been cropped, manured, and labored in all respects alike." "The lines of separation (of the varieties) ought to be well defined, to guard against the mingling of the different varieties in the operation of sowing and harvesting. I recommend the seed to be deposited by a drill across the ridges, with a vacancy of three feet intervening between the varieties, and the seeding of all the land to be executed on the same day." "Respecting the quantity of seed, I can testify, from experience and observation, that even with the same variety of wheat, any material difference in the state of the plant, all other circumstances being alike, influences the size of the ear, length of straw, and time of ripening, and the quantity and quality of produce, as well as the effects of red gum and mildew." He says, "a thin plant (*i.e.* a small number of young plants of wheat standing on a given space of ground) generally enlarges the ears and corn, and retards the ripening, and aggravates the effects of red gum and mildew, while the straw is shortened both by a very thick and a very thin plant. It is therefore desirable, in comparative trials, to have all the varieties of the same thickness of plant."

Another source of error which he mentions, is "the different propensity of different wheats to tiller, or send out side shoots."

He recommends, therefore, the trial wheats to be sown "not by equal measures, but by measures calculated to contain the same number of seeds;" and also that the seeds should be sown "so thick as not to call forth the tillering propensity." He recommends, also, that journals of comparative trials should be kept, "embracing the appearance of the crops at all the different stages of growth, with the weather," or any other influences which may occur. A German writer of great celebrity further recommends that an estimate of the number of kernels of a kind be made by counting the number contained in a small measure, so as to give still greater accuracy to experiments made on this subject.

The following are considered, by an authority on this subject in our own country, as suitable characteristics to be taken into consideration in selecting wheat for our crops:

"1st. The general hardiness of the plant, and capability to resist the Hessian fly, or throwing out by frost and winter-killing; rust, and mildew.

"2d. A good strong upright stalk, with just enough straw for the object, and no more.

"3d. No beard is desirable; a head filled and heavy, and retaining the grain as long after it is fit to cut as possible.

"4th. A predisposition to tiller well.

"5th. A plump full berry, capable of yielding a large quantity of white flour, with a large proportion of gluten, and as little bran as possible."

The number of varieties of wheat is very great. Colonel Le Conteur, of the island of Jersey, had, it is said, in his possession 150 varieties, produced by himself and others, and some of the new ones have been greatly superior to the old ones.

It is desirable that the skill and ingenuity of our countrymen be exercised in producing and proving new varieties, as also introducing new and improved varieties from abroad. One gentleman, some years since, imported from England and Scotland a bushel each of 20 varieties out of 100 which he examined while in those countries; but owing to the want of suitable opportunities for doing so, few have been tested. Some of them were tried, but not on a variety of soils; they did not stand our winters; but by further trials might do so, as it is known that the wheat-plant is one which possesses the power of adapting itself to climate. Some of the English improved varieties are found to be hardy enough, and these might, no doubt, be tried with great success.

Some experiments lately made also indicate that there may be an improvement as to the usual *time of securing* the crop. By the quarterly journal of the Royal Agricultural Society, it appears that wheat cut a fortnight before it was ripe, produced an increased quantity and weight in flour and straw, with a better quality of both. Mr. John Hannam, of North Deighton, near Weatherby, in England, cut a sheaf in his field, August 4, 1840; the wheat was then green—*i. e.* both the straw and ears were in full vigor and sap; the grain was perfectly formed; but the chaff so strongly adhered to it, that it was scarcely possible to separate them by friction in the hands; it was then plump, but so juicy, that on the slightest pressure it yielded its milk. He let it stand in the field a fortnight, and then housed

On the same day this was done, (August 18,) he cut another. This, too, was yet green, or at least not ripe, or what is usually termed raw; the

straw, though looking green, when closely examined was fast approaching to yellow, and a foot from the ground was quite yellow. The ears, also, were more open; the chaff of various shades of yellow and green; and the grain, though soft and pulpy, yet not so full of fluid as before. In a fortnight after, the whole field was ripe, when he cut his third sample, (September 1.) The same day he housed the second sheaf. This third was not so far ripe that the straw would break, and the ears curl, and the grain shake out; but it was in its usual state when reaping commences, when the straw is entirely yellow. This third sheaf was left (as in the case of the former ones,) a fortnight on the field, and then carefully housed. From each sheaf 100 ears were selected and put away in a bag, preserving also the straw of each. On threshing them, the following was the result:

Comparative weight.

	Gross produce.	Equal measure.	Equal number of grains.
No. 1, cut August 4, (green) -	- 756	568	$19\frac{3}{4}$
No. 2, cut August 18, (raw) -	- 736	580	$23\frac{1}{4}$
No. 3, cut September 1, (ripe)	- 650	570	$22\frac{3}{4}$

The comparative weight of the straws was:

No. 1, (green) - - -	- 550
No. 2, (raw) - - -	- 475
No. 3, (ripe) - - -	- 450

As to the value of the same, by the judgment of an extensive grower, the following was the result:

No. 1, 61 shillings per quarter, or \$1 $67\frac{3}{4}$ per bushel.
No. 2, 64 shillings per quarter, or \$1 76 per bushel.
No. 3, 62 shillings per quarter, or \$1 $70\frac{1}{2}$ per bushel.

A miller valued them at the same rate, with the exception of No. 2 at 63 shillings, and No. 3 at 61 shillings. Mr. Hannam's deductions are—that the wheat reaped a fortnight before it was ripe has the advantage of the ripe in every point of view: 1st, in weight of gross produce, thirteen and one-fifth per cent.; 2d, in weight of equal measures, nearly one-half per cent.; 3d, in weight of equal number of grains, nearly two and one fifth per cent.; 4th, in quality and value, above three and one-fourth per cent.; 5th, in weight of straw, five per cent. That reaped a month before it was ripe, has the advantage of the ripe twenty-two per cent. in point of straw; but in other points the disadvantage, thus: 1st, weight of gross produce, eleven and five-thirteenths per cent.; 2d, weight of equal measures, rather more than one-third per cent.; 3d, weight of equal number of grains, better than thirteen and one-tenth per cent.; 4th, quality and value, rather more than four-fifths per cent. The advantages, then, of cutting the crop a fortnight or so before it is fully ripe, may be thus summed up: 1st, straw of better quality; 2d, a better chance of securing the crop; 3d, a saving in securing it. It is stated that, with regard to the crop of 1839 in England, the beginning of the reaping was late; and the result in the north of England was, that full seventy-five per cent. of the whole wheat crop was damaged. The saving of securing the crop is two-fold: there is less waste in reaping or

from strong winds; and the expense of it is said to be less. Mr. Hannam tried another experiment; which showed a result, in 100 lbs. of grain grown, as follows:

	Flour.	Seconds.	Bran.
No. 1 was cut one month before fully ripe - - -	75lbs.	7lbs.	17lbs.
No. 2 was cut three weeks before fully ripe - -	76	7	16
No. 3 was cut two weeks before fully ripe - -	80	5	13
No. 4 was cut one week before fully ripe - -	77	7	14
No. 5 was cut when ripe - - - -	72	11	15

Thus, No. 3 gave more a bushel than No. 5, by six and a half, and a gain of about fifteen per cent. on the flour of equal measure of grain. In grinding, it was found that No. 5 ground the worst of all; there were a greater quantity of flinty particles which would not pass the bolt than in any of the others. The bran from No. 5 was coarse and heavy, while that from No. 3 was as "thin as a bee's wing." He then sums up the advantages of cutting two weeks before it is fully ripe: 1st, there is a gain of fifteen per cent. of flour, and equal measure; 2d, a gain in the weight of straw of fourteen per cent.; 3d, a gain of 163 in the value of eight bushels, and a gain of about 583 on every acre of wheat producing twenty-eight bushels—his calculation being founded on the price of wheat at that time in England.

An experiment of cutting the grain ten days earlier than usual was also tried by a farmer in Michigan, on sixty acres—the berry being soft and in the milk; and the result was, that it yielded more flour and less bran than usual. Another advantage of early reaping is stated, on good authority, to be security from rust. A farmer is said to have tried an experiment on this subject. Finding one of his fields of wheat, in a very raw or green state, was badly struck with rust, he determined at once to cut it; and did so, amid the laugh of his neighbors, who thought him crazy. The fields adjoining suffered little from rust, and stood till fully ripe; yet, at threshing, that which was first cut gave the finest wheat and the best yield.

The question as to the best methods of preventing the diseases and attacks to which the wheat crop is exposed, is one of deep interest to the agricultural community; and some suggestions on this subject may not be inappropriately subjoined to the account of this crop. The time when the field is struck with rust, seems to be just at the time of ripening. A remarkable fact on this subject is stated in a report to the New Jersey Agricultural Society. An extraordinary field of wheat, supposed to be out of danger, on a hot day became drenched by a sudden shower, which came on between one and three o'clock, p. m. All was still; and on the passing away of the shower, the sun came out intensely hot. The owner went into his field to examine his wheat, which he found much pressed down by the shower: he immediately perceived a continued ticking, or snapping noise, in every direction. The straw was fine and bright; but, on examining it, he found it bursting in short slits one quarter of an inch long, and the sap exuding from it. A day or two after, the whole field was darkened with rust, and the wheat nearly ruined. Another instance of the same kind is also related. The conclusion stated is—that the loss of the sap, running out and becoming dried on the straw, occasioned the rust. The ancient Greeks and Romans attributed rust to the effect of the weather on the grain, as has been mentioned above, and had a prayer to the supposed Rubigo, or rust, for the purpose of warding off the disease, which ran thus:

"O, blighting Rubigo, spare the corn-plants, and let the ear gently wave o'er the surface of the earth; suffer the crops, which have been nourished by the propitious stars of heaven, to grow until they become fit for the sickle. Thine is no small power; the crops thou hast marked, the dispirited cultivator reckons as lost—neither winds nor showers so much injure the corn; neither when bitten by frost does it acquire so pallid a hue, as if the *sun fervently heats, the moist stalks.*"

Mildew and rust are said to be more common now than before the Hessian fly made its appearance. "Previous to that time, the wheat was sown the last of August and the first of September, tillered largely, obtained great strength of roots, and was but little injured by winter frosts; the effect of which was to produce strong bright straw, with but few leaves; the consequence of which is but little mildew and rust."

To avoid the fly, manuring high at seed-time and sowing late was resorted to. This was attended by mildew and rust. Being sown so late, the plants had no time to tiller, or multiply and strengthen their roots and stalks; of course, the winter weakened and thinned the plants, which made the wheat still later in the season; and, when highly manured, the straw was full of leaves, very succulent, usually mildewed, and almost rusted. "The means of prevention are—first, a good dry, loamy soil, well prepared by cultivation, and not too recently manured, that by cultivation there may be a good assimilation of manure to the soil: the more complete, the better. Cover the seed about two inches deep, either with drill or plough, that it may have good hold of the soil, and not be thrown out by winter frosts." It is also said the French chemists, having witnessed the blighting of human food, have suggested the use of charcoal, to absorb the excess of the ammoniacal and other salts, which, taken with the plant in excess, during the warm showers, when the berry is growing, cause the stalk to burst open, its juices to exude, and the seed to shrink. The result is stated to have been satisfactory. The mode of using the charcoal, as suggested, is by strewing it, well crushed, and as soon as possible, over the land; and that it be well moistened with soft water, by means of a watering-cart. Ashes have likewise been recommended by Liebig and others. Some suppose they, or some alkali, are necessary to dissolve the silicious substances, to furnish strength to the stalk. Liebig supposes it to furnish a silicate of potash—an important ingredient in the growth of wheat. Some soils, peculiarly free from rust, it is said, are supplied with unusual quantities of potash. It has also been recommended, as a means of securing a good crop, notwithstanding rust, when the plants appear thin on the ground, in the spring, to sow spring wheat among the fall wheat. This plan has been resorted to with good success in Canada.

Bone manure is likewise mentioned as very useful for grain, as bone is said to contain many valuable principles, such as fat, gelatine, carbonate and phosphate of lime. A striking experiment in confirmation of this is mentioned. The distinguished Berzelius, in 1817, is said to have analyzed a soil which had yielded crops of grain, from time immemorial, without manure. It was found to contain small fragments of bone; and after it had been boiled a long time in water, afforded a solution which yielded a precipitate to the infusion of galls. From this result, he conjectured that the ground had once been a field of battle.

A variety of expedients are mentioned *to protect wheat from smut;* and it may be well to mention some of these, as they are well recommended.

One directs the wheat, after being thoroughly washed, to be soaked ten or twelve hours in salt water, as strong as it can be made. It is further said that no injury will result if it lies in the brine for several days, provided it be in a cool place. After thus soaking it, let it be limed. Another person recommends that the seeds, when placed in the brine, be stirred up thoroughly, so that the light seeds may rise to the surface, and be skimmed off; afterwards, that the brine be drained into a tub, and the seed thinly spread on the floor, and sifted with quicklime, at the rate of one gallon to a bushel; and, after carefully stirring the lime through the seed a few times, it is allowed to remain a few hours, and then sown. The seed which underwent the perfect cleaning gave a return of pure wheat; and that which was sown in its natural state was infected with smut, and had a mixture also of chess. In a Northumberland report on agriculture, it is stated that Mr. Culley, who grew annually from 400 to 600 acres of wheat, had but one instance of smut in forty years, and this was when the wheat was not steeped. Another experiment was tried on seed, in which were a few balls of smut—one-third being steeped in chamber lye, and limed; one third steeped in the same, and not limed; and the remainder without steeping or liming; and the result was, that the seed pickled and limed, and that pickled and not limed, were free from smut, but the other had smutty ears in abundance. Another experiment was tried, by taking a peck of very smutty wheat, of which one-half was sown in its natural state, the other half washed as clean as possible, in three waters, soaked two hours in brine strong enough to bear an egg, and dashed with lime: the result was, two thirds of the unwashed was smutty, but of the pickled and limed seed there was a full crop, without a single ear of smut. A similar experiment, somewhat varied, is the following: Of four sacks of smutty wheat, one sack was soaked in strong brine only; one prepared with lime only; one was soaked in strong brine, and then lay in lime all night; and the fourth was sown without anything: the result was, where brine only was used, now and then there was a smutty ear, but not many; where lime only was used, there was about the same quantity of smut; where lime and brine were used, not a single smutty ear could be found; and where nothing was used, it was a mass of smut. In another experiment, however, mentioned in the Southern Planter, wheat salted at the rate of a quart of salt to a bushel succeeded effectually in preventing smut. Many other substances are mentioned as useful for the same purpose. Mr. Bevan made an extended course of experiments in England, which are found in the ninth volume of the English Agricultural Magazine. He took both sound and smutty grain—the first being designated in the following table of results by the letter A, and the second by the letter B:

	Number of smutted ears in three sheaves.		Bushels of good wheat per acre.		Cwt. of straw per acre.	
	A.	B.	A.	B.	A.	B.
Solution of potash - -	1	81	21.6	13.6	36.6	29.1
Muriate of potash - -	3	218	20.2	10.1	36.0	21.1
Nitrate of potash, (saltpetre)	17	115	23.8	14.3	36.0	31.9
Soda - -	9	159	20.2	11.7	35.6	26.7
Muriate of soda, (com. salt) -	–	290	24.0	14.5	41.5	33.3
Sulphate of soda, (Gl. salts)	12	241	21.6	12.3	38.5	27.8
Muriate of ammonia, (sal am.)	1	150	19.8	17.6	35 4	30.2
Common soot - -	–	123	20.8	11.4	34.8	25.3
Lime saturated - -	–	2	21.9	12.4	38.7	25.9
Muriatic acid, (spirit of salt)	–	13.6	20.7	16.1	35.7	34.1
Sulphuric acid, (oil of vitriol)	–	–	20.4	17.8	35.4	34.1
Dry, in its natural state -	–	6.323	20.3	14.7	35.7	31.0
Washed in common water -	none	sown.	10.7	18.3	–	35.8

This course of experiments indicates lime-water to be the most effective. Putsche, in his German Encyclopœdia of Agriculture, gives the following as the receipt of M. Schruitz, of Dürer, in the province of Juliers, in Prussia. So confident was M. Schruitz of its efficacy, that he offered a standing reward of a ducat for every head of smutted wheat found in his field. For every 500 pounds of seed wheat, take 1 pound of alum, 1 pound of copperas, ¼ pound of saltpetre, ¼ pound of verdigris: pulverize these ingredients, and dissolve them in a sufficient quantity of boiling water. When the solution has become cold, add as much more water as will be required to moisten the whole thoroughly. The heap should be turned several times within the ensuing 24 hours, well mixed: it is then ready for seeding.

The cause of the smut, which has prevailed very considerably for some years, is thought, by the best judges, to be the neglect of liming which has taken place in our country. It is hoped that, by again resorting to the simple expedients, which are so effectual, our farmers will hereafter prevent the evil which has so much injured this most important crop.

Few persons are aware of the amount of wheat flour consumed in our manufactures. It is stated on good authority ~~that the manufacturers of~~ New England, in 1842, ~~used more than 200,000 barrels of flour in mak~~ing starch and sizing for their goods; being a larger quantity than was exported to England in the same period. The single State of Massachusetts, in the same period, consumed more flour than was exported to all foreign countries. It is probable that the consumption of wheat flour for these purposes, the past year, has been much larger.

BARLEY.

This crop has probably lessened the past year; the same causes which have operated for a few years past to discourage attention to it, have operated still more during the last year. The progress of temperance has led to

the discontinuance of many breweries; and as it has never been a very favorite crop, there has been no reluctance to turn off to other crops as far more profitable. The barley crop of 1843 also suffered severely by the weather. To particularize:

In Maine, in some instances, it is supposed to have fallen off at least one-half; the general average of decrease may be stated at one-quarter. In New Hampshire more, comparatively, was sown, and in some cases it might have been an average crop; but, on the whole, it fell off as much as 10 per cent. In Massachusetts it was light; "worms in the straw" diminished it, as well as the drought, and it cannot be rated at as much as last year by 15 per cent. In Rhode Island the falling off has been estimated at 25 per cent. Little is sown in Connecticut or Vermont, and the decrease was 15 per cent. In New York, which raises the most barley of any State in the Union, the decrease is probably about 20 per cent.; the notices and information respecting it are various. In western New York it is pronounced, by one well qualified to judge, to be good in quality, and usual in quantity. Another, speaking of the whole State, but especially of Orange county, says: "For many years prior to 1842, the maize crop was an almost total failure through a considerable part of the State of New York, owing to early frosts; and the farmers, in those sections of the State, very generally cultivated *barley* in its stead; distillers preferring that to any grain as a substitute for maize. The number of distilleries having greatly diminished, and the year 1842, as well as the present year, having been very favorable for maize, farmers have again returned to the cultivation of the latter. The only market now for barley is afforded by the brewers; and as they cannot use old barley, the farmer cannot store it for a higher price, and will not, therefore, raise it when other crops can be cultivated with equal profit." In an agricultural journal it is remarked that "barley is not as extensively cultivated as formerly, as in the great barley-producing districts of central New York it is probable that not more than half as much was sown in 1843 as in some previous years." Two causes are assigned for the decrease: "the less demand for barley for brewing, on account of the temperance reformation; and the farmers found that the constant cultivation of spring crops was getting their best lands so foul, as seriously to injure their productiveness." On account of the depreciation of barley as an article of profit, "much barley land has been seeded down, put into hoed crops, or fallowed for wheat." In New Jersey, in consequence of the early drought, the crop was lessened at least 25 per cent.; by some, the estimate of decrease is even put at 50 per cent. The same remarks may be made with respect to Pennsylvania, though in portions of the State the crop is judged to be an average one; yet, owing to the diminished use of fermented liquors, and to the weather, the falling off cannot be rated at less than 25 per cent. In Delaware, Maryland, and Virginia, so little is raised, that it forms scarcely an item in their report of the crops; the general decrease for these States may be put at 10 per cent. The information from many of the other States is small, and we are forced to make a more conjectural estimate than with respect to other crops. In Kentucky the crop seems to have been comparatively good; though, on the whole, there was a small decrease. In Ohio, in some parts of the State the falling off is set as high as one-third, one-half, or two-thirds; in others, it was a somewhat larger crop than that of the previous year, but the general average decrease cannot be less than one quarter. The cause, as stated by a well-known brewer, is, that "the spring was too late, on ac-

count of wet and cold, to sow it; and the heat too great at the time it was filling the heads." In Indiana, and the other western States, there was also a very sensible decrease. This crop in Michigan was injured by the drought in June, and part of July, and fell off as much as 15 or 20 per cent.

Some species of barley are mentioned in foreign journals, which might perhaps deserve more particular inquiry, were it not that so little attention is paid to this crop in our country. The Himalaya barley is said to give a fifty-fold-product, and yields a fine baking flour and admirable malt, needs only a quarter of a year to mature perfectly, and neither frost nor heat injures it; it has been raised, without difficulty, 10,000 feet above the level of the sea.

A species of Peruvian barley is mentioned likewise as growing in a garden; the produce of which for one grain is 55 ears, many of which contain 100 grains. The general produce of each is said to be from 20 to 30 ears.

The aggregate estimated crop of barley for the United States, the past year, is 3,220,721 bushels.

OATS.

There has been a decided falling off in this important crop the past year, from the influence of the season. The crop of 1842, as will be seen by reference to the report for that year, was above an average one. The causes of decrease the past year are the same as those which have been specified in the account of the grain crops in general—a cold wet spring, drought in summer, and successive rains. In New England the general average of decrease was about 10 per cent. This estimate fixed on may not, perhaps, correspond with particular sections. Thus, in Maine, while the crop in a part of the State is judged to have been "about as last year," in still another the decrease is rated as high as "25 per cent." The same diversity occurs in the accounts obtained respecting New Hampshire, and it is variously estimated as "the same as last year," "10 per cent. above the average," and "from 10 to 20 per cent. less, being injured by the wet season." A good judge, speaking of this crop in Massachusetts, says that it is a light one—"not more than two-thirds as much as usual, owing to the drought;" and yet another considers it as "lighter than last year." In the central section of the State the view taken is more favorable, and it is thought there was an advance of perhaps 5 per cent. above the crop of 1842. On the whole, the decrease for the whole State was probably 10 per cent. compared with the former year. In Rhode Island and Connecticut there has been a similar general decrease; while in some portions of the latter State the injury sustained has been rated as high as even "30 per cent." on account of the drought. The extreme hot weather continued longer in certain sections than in others, which were refreshed with occasional showers.

In Vermont, while it is thought to have been "an average crop," yet, on account of the former crop having been above the average one, it must probably be fixed at about 5 per cent. below that of 1842. The earliest notices of this crop, for the past year, in New York, are, that "there will not be an average yield." In accordance with this, we are informed, also, at a still later date, that in western New York "there was a less quantity sown, and the general growth has been less." They are said, however, on the same authority, to be "well headed on a light straw." In respect to other portions of this section of the State, it is stated to have been a larger crop than the previous year, and some cargoes of this grain had been shipped to Wis-

consin. It is estimated by the editor of an agricultural journal of high reputation at "25 per cent. less, owing to the cold dry spring, and early summer months." There was, however, considerable diversity in the various counties. In the counties of Cattaraugus and Chatauque, where it is a principal crop, it is thought to have been but a "medium crop." More towards the central part of the State, as in Cayuga, Cortlandt, and Onondaga counties, it was an "ordinary crop," "better in quality, and about the same in quantity." In Madison and Oswego counties it is thought that it was "not so abundant as last year, (1842,) but a good crop." Of the southern counties in the central part of the State, from Allegany to Tioga, this crop was "about an average one," but probably "20 or 25 per cent. less" than in 1842, owing to the fact that then there was "a great yield," and "the season was too dry." Along the valley of the Mohawk, owing to the favorable season, it has been estimated as "25 per cent. better." In the western part of the State it is considered to have been "a good crop." Oats, however, suffered much in the eastern section of this State. In some of the river counties, it is estimated at "20 per cent. less." A good judge, after having examined the information he could obtain respecting this crop, says: "A severe drought in the eastern portion of this State, commencing about the time the oats came up, materially injured the crop. This is a principal staple in that section of the State, and the crop there is not much more than half as great as last year. In the western part of the State the crop is understood to be good, but it is believed the deficit in the State will be at least 20 per cent. The price in the New York market is about 45 per cent. greater than in December 1842." Another also says, "a light crop in grain and straw." On the whole, it is thought that the crop must be estimated at 20 per cent. less than in 1842; though, compared with the crop of 1841, it would equal, perhaps exceed it, and may have been an average one. A similar decrease should be made in New Jersey; and, by some, the crop of oats there is supposed to have been "50 per cent. less."

Pennsylvania is a large producer of oats; and though in some counties of the northeast of central portions of the State it is said to have been "10 per cent. increase," "better yield than the former years, but the crop not heavy in the bushel," "average," good crop," "fine and heavy," yet the information obtained generally is unfavorable. The editor of an able agricultural journal says that it is "25 per cent. short in quantity and quality." In the southwestern corner of the State, bordering on Virginia and Maryland, the counties near the centre, on the Juniata and east of the Susquehanna river, and the counties lying on the Delaware, in the southeastern part of the State, the decrease is represented to have been "one-third less." The reason assigned in some of these cases is, that the "ground was generally too wet and kneady when sown, and dry and crusty in June and the forepart of July." In the county of Lancaster, the crop is pronounced in an agricultural journal to have been "a good one—a full average of 50 bushels to an acre," and it is said to stand up unusually well. On a review of all the information obtained, it is thought that to fix the deficiency at 20 per cent. below the crop of 1842 will probably be a fair estimate. The deficiency was as large also in Delaware, and, by some, the falling off is estimated as high as 25 per cent. Another, and a good judge, speaks of it—not with a reference so much to the crop of 1842, with which it has been most commonly compared, but in general—as "a fair average crop, somewhat injured by the constant rains during the season and at harvest." In

Maryland, a high authority speaking of this crop at an early date, says "the seeding of oats is short, owing to the impossibility in many situations of ploughing." Another, in a journal still later, pronounces "the oats short, and the crop light." By others, however, in other sections, the crop is thought to have been "about the same in quantity and quality as in 1842." The general estimate may be fixed at 10 per cent. less than in 1842, when it was a good crop. In some parts of Virginia it is rated at even "one-third higher than in 1842," when it was destroyed by the great rains; and in others, that "it will not vary much from the crop of that year, though, owing to dry and very hot weather last June, and at the time when oats were coming to the head and forming the grain, the quality is very inferior to that of 1842." But other information obtained represents it to have been "short, on account of the dry spring"—"25 per cent., owing to the drought about the time of ripening;" and the general estimate may be fixed at about 10 per cent. decrease on the crop of 1842.

The crop of oats the past year in North Carolina, it is thought, was better than that of 1842 by at least 10 per cent. Some of the notices respecting it are like the following. From a good authority, in the month of July the crop in this State is said to be "extremely good." After the harvest, it is pronounced by one "an average crop, as good as 1842." Another sets it as high as "20 per cent. more." There was probably no great difference between the crop of 1843 and the previous year in South Carolina; though there might have been an advance of about 10 per cent., taking all the causes into consideration which might operate to this effect. In Georgia and Alabama, they were probably 10 per cent. less than in 1842. The crop of oats in Mississippi is differently estimated in different parts of the State. One informant says of this crop, "very fine, and an increased quantity was sown." Another thinks that, on account of the cold spring, they fell "50 per cent. short." Taking the State through, the average decrease may be fixed at 10 per cent. A similar diversity prevails in regard to Tennessee, which raises a large crop of oats. In the southwestern part of the State, they are said to have been "very fine." In the southeastern section, the estimate is that they were "25 per cent. less" than in the year 1842; while, in the central parts, they were "large and abundant." On the whole, the average increase of the crop may be rated at 10 per cent. above the previous year. A very good authority pronounces this crop in Kentucky to have been, in the upper central part of the State, a good one—about the same as that of the year before. Another, speaking of the same section, places it "10 per cent. above the average in grain, on account of the good season in its filling."

In the south central part of the State, the increase is rated as high as 25 per cent. The general average may be fixed at about 25 per cent decrease from the crop of 1842.

The information is ample respecting this crop in various parts of Ohio; but it is somewhat difficult to fix the graduation among the conflicting accounts. In the northwestern corner of the State, it is thought to have been "25 per cent. less, on account of the drought in the summer." Of the southeastern counties, also bordering on the Ohio, and back, an informant remarks: "The oats, in consequence of the coldness and rains in the spring, were put into the ground late, and in small quantities; and the subsequent dry weather materially affected their growth, so that not exceeding half a crop was obtained." A good judge in the southwestern part of the State,

on the Miami, computes the decrease at "one half;" and assigns as a reason for this loss, "the late spring, wet and cold for sowing it, and the heat too great when it was filling." Another person calculates the average decrease at "one-half for the whole State;" but this is probably too large. In the vicinity of the Sciota, on the east, the crop of oats is said to have been "very light—less than last year by 30 per cent." On the other hand, in the southern section of the State, west of the Sciota, it is thought that the crop "is as good as usual;" and on the Ohio, in the southern central part, "more abundant than last year (1842) by 20 per cent." In the central section, lying between the Muskingum and the Ohio and Erie canal, it is judged to have been "equal to the crop of 1842." In the central counties, also, which lie on the Sciota on the east, and the Muskingum on the west, there was "an increased quantity sown, and more careful and skillful cultivation;" so that it is estimated the increase was at least "10 per cent." The whole crop of Ohio is estimated at 20 per cent. less than in 1842.

With respect to Indiana, the estimate for the average of the whole State, after carefully weighing the various accounts, has been fixed at 10 per cent. increase. In the southern central counties, lying on and between the eastern and western forks of the White river, the crop is thought to have been "20 per cent. more than the year 1842." In the counties lying in the southwest corner of the State, "there was a fair crop;" but it is added, by our informant, that it is "never heavy in southern Indiana, as the best seed degenerates there." In the southeastern section of the State, reaching as high up as Clark and Jennings counties, the crop of oats is considered to have been "about the same as in 1842;" while further above there is thought to have been "20 per cent. less, in consequence of a late cold spring, and a very late sowing." In the northern counties, bordering on the State and Lake of Michigan, the information obtained respecting this crop is, that "the early-sown oats were a fair crop; the late-sown injured by drought, and were full 20 per cent. below the average." In the western central counties, lying near the Wabash river, the crop is pronounced to have been "a fine one;" while in the counties lying around the centre of the State, it was, in the judgment of the informant, "a heavy crop."

The crop of oats in Illinois is, by some, pronounced to have been "tolerable all over the State;" by others, "better than ordinary;" again, near the mouth of the Illinois, "about the same as last year," (1842;) on the southeastern side, "about an average crop;" while another, whose means of information entitle his opinion to more than ordinary weight, speaking of the crop, pronounces it to have been "light—three-fourths less than last year, both in Illinois and Wisconsin Territory." It is probable that this estimate is too large; but, in view of all the information obtained, it is believed that the crop was less than that of 1842, by at least 10 per cent. In Missouri, notwithstanding the great loss of the wheat crop, the crop of oats is said to have been "a good crop;" and has been estimated at 10 per cent. advance over that of the former year. Neither in Louisiana nor in Arkansas has this crop received notice of the journals, because little or none is there raised. The crop of oats fell off in Michigan the past year at least 25 per cent. In the earlier notices of the crop, it is stated that "oats are suffering from drought." Since the harvest, too, the information obtained is similar. Thus, by one informant we are told, respecting the northeastern counties, "the crop was injured by the very cold weather in the spring, and the excessive heat in the latter part of June and the month of July, and is less

than last year (1842) by perhaps 10 per cent." Another estimates the decrease in the southeastern section of the State at "one-third;" while in the western, the decrease is thought to be "from 40 to 50 per cent.," as the crop of oats in 1842 was there "remarkably good." These estimates are probably too large; and it has therefore been fixed, as above mentioned, at 25 per cent.

The crop in Wisconsin and Iowa Territories was somewhat less than the average one.

The whole crop of oats for the United States in 1843 is estimated at 145,929,966 bushels, which is 4,853,651 bushels less than the crop of the preceding year.

Oats are said to be the easiest of all crops to degenerate from want of care; and this, probably, is often one cause why the crop is injured, or does not succeed as well. Among some of the varieties which are highly recommended in England, of which little trial has yet been made in this country, is the *Hopetoun*, which Low says was produced in 1824 among a crop of potato oats. The stalk, which was remarkably tall, was watched, and the grain gathered and sown. By repeated sowings, its superiority was maintained, and a new variety established in 1827. It is said not to be so white as some other species of this grain, nor as free from beard and awns; but it is very heavy, has a strong straw, with large spreading heads, and is not very liable to shell the grain. It is considered in Scotland as one of the best varieties, especially on land not of the best quality.

The *white Tartarian* oats are said to be well adapted to our climate; and this variety is highly esteemed by those who have cultivated it. The straw is also very long and upright, and not apt to lodge; the heads long and large, and inclined to one side. It is a few days behind the other kinds in ripening, but it is said to be a highly-productive and a certain crop.

The *black Tartarian* oats.—Lawson says that the culture of this variety is extending in Scotland, and that it answers best on high and rather superior ground. The varieties of black oats found in this country are said to be the old black oats of England, and of an inferior quality. The black Tartarian is said to resemble the white Tartarian in the form of its head, and the inclination to one side. The straw is only of medium length, the grain black, shorter and more plump than the white variety, less awned, and earlier in ripening. This and the white variety are further said to be the best description for the poorest exhausted soil, producing more straw on those sorts than any other variety.

Another variety of oats, called the *Georgian* oats, is also mentioned as introduced into England in 1824. In a trial made of it there in 1826, in connexion with the potato oat, it appears that it was reaped ten days earlier, yielded 3,354 lbs. of straw and 68 bushels of grain to the acre; and the weight of meal, from 6 bushels of the oats, was 146 lbs.

RYE.

This crop, which is a favorite one in the New England States, appears not to have varied greatly in that section of the country. In Maine, in some parts, it was lessened, as judged by one informant, "40 per cent.;" by another, it is pronounced to have been "about the same as in 1842;" while a very good judge, speaking of another portion of the State, thinks the increase to have been 20 per cent. It has been fixed in the estimate

at 5 per cent. less, on account of the season. In New Hampshire, it is thought, by one whose means of information are better than ordinary, to have been "an equal crop," at least, as there was "more sown," notwithstanding the injury sustained by its being winter-killed. Others pronounce it to have been "an average crop, varying but little in quantity or quality from the last year;" while by others still, it is judged to have fallen off, from injury by the wet season, "from 10 to 20 per cent." In fixing it at 5 per cent. decrease, it is supposed that the estimate may be more correct for the whole State.

The notices of this crop in Massachusetts, in the early part of the season, are various. In June, it is mentioned in an agricultural journal as "very good—much as it was last year." Some of it was winter-killed—not owing to the depth of the snow, but the openness of the month of January, or rather the rain followed by severe cold. In July, it is said to have looked "well." In August, to be "good;" though, "in some cases, pinched or rusted." In the central part of the State it is thought to have gained at least 5 per cent. above the crop of 1842. By others, it is said to have been "good;" "average;" "very good;" "much better than it was the previous year." On the whole, therefore, its advance for the whole State may be estimated at 5 per cent. The same is the case in respect to the other New England States, as the crop is said to have been "about the same as 1842;" a "fair crop;" "average;" "the stalk tall, and heads long."

New York produces considerable rye; but it is not one of the prominent crops of that State, and therefore is less noticed. From the information gathered—which speaks of the crop as an "average one;" "10 per cent. more, owing to favorable weather;" "middling;" "more than an average, especially in the growth of straw;" "the usual crop;" "fair"—it is thought that its increase for the whole State did not probably exceed 5 per cent.

As the crop of New Jersey is thought to have been about the same as last year, a small increase only has been allowed in the estimate.

Pennsylvania still ranks first in the production of this crop; and, as we learn, from one whose means of information are better than usual, that the crop was "a fair one," "better than for several years past," the average rate of increase for the State has been fixed at 10 per cent. In some parts, it fell off; in others, it was thought to be "equal to the crop of 1842;" in others still, "at least 5 per cent. better, owing to the season." In Tennessee and Kentucky, there was likewise a small increase. In Ohio, Indiana, and Illinois, it probably fell off 10 per cent. Some of the notices from the first of these States are, that "it was 25 per cent. better," "about an average crop," "10 per cent. less," "25 per cent. less, on account of the drought," "same as in 1842," "one-quarter less, as the crop of the former year was very good." Again, it is said to have been an average crop for the whole State. In Indiana, it was "light," "little raised," "perhaps an average crop." In Illinois, "somewhat less," "about half a crop." In Michigan, the crop of winter rye was above that of 1842, while the summer or spring rye suffered by the drought in June and July. On the whole crop for this State it is thought that 10 per cent. increase will be a fair estimate.

The whole crop of rye for the United States amounts to 24,280,271 bushels.

A variety of rye, which is called the *multicole* rye, has been mentioned during the past year in the agricultural journals. It is said to be a native of Poland, and that it has been introduced into cultivation in France

with great success; and the account given of it in the London Farmers' Magazine is, that "it grows on common soil, suited to the old-fashioned rye, but its habits are totally different. By the report of above thirty respectable agriculturists near L'Orient, who have cultivated it the past two years, it does best when sown the first of June. Its growth is most rapid. The two crops of it before July are cut for hay, and by the 15th of August a grain crop is reaped. The straw is from 8 to 10 feet high, and the ear from 10 to 18 inches long. An account of it may be found in the Transactions, published by the French Minister of Agriculture." After considerable search for the above named work in this country, we have been disappointed in obtaining it. This species of grain has been tried in this vicinity, and the opinions expressed respecting it are diverse. One gentleman writes to this effect: "I have the highest opinion of the multicole rye, and this opinion is founded upon an experience of three years. More than four years since, I saw, in a French periodical publication devoted to agriculture, an account of this rye, similar in its tenor to that which has recently gone the rounds of our newspapers. Having experienced the worthlessness of the common rye about here for seed, and being convinced that any change would be for the better, I forthwith requested a friend, then consul at Paris, to procure and send me a small quantity of the multicole rye. He did so; and I received it (about two quarts) in time to sow it early in the autumn of 1840. It was put into poor land, and the product was more than a bushel and a half. In the autumn of 1841 I sowed with it (much too thickly) a half acre of poor land. The product was a little over twenty-six bushels. In the autumn of 1842, I put in about an acre. The product of this year I have not yet ascertained, as I have not threshed it all. It may, however, be estimated at about fifty bushels. The peculiarities of this rye are the smallness of the grain, the length of the ear, and the lateness of its maturity, as I have never cut it till after wheat-harvest. It seems to be perfectly hardy. Three pecks to an acre is seed enough. I have never tried it as a summer crop, but intend to do so next year." The other account, from another gentleman, is less favorable. He says, "I have from thirty-five to fifty bushels of the multicole rye. I do not think favorably of the grain. I have had some ten bushels ground for bread, and had returned to me only thirteen bushels of flour; the balance being bran. In order to test the grain fairly, I seeded five acres of fine land with it, such as would have brought me fifty bushels of corn per acre. It came up well, and looked so promising, that it was a subject of remark by all passing the field. Its extraordinary length of head, and the general appearance of the plant, were highly encouraging. I harvested it in good time, and got it in my barn without its being damaged in any manner, and have found its yield miserable. The grain, when I got it, was remarkably small; it has increased in size with me at least one-third, and it is possible that, by continuing its culture, it may yet be as large, in the course of time, as our native rye."

It will be observed, in the two experiments just given, that one was on poor, the other on rich land. It is possible that there may have been less adaptation in the latter soil for the crop than in the other. The experiments were with the grain in the fall, and it is apprehended that it should be sown in June, and pastured the first year, also pastured the succeeding spring; or cut once for hay, and then harvested; thus furnishing an excellent article for wintering cattle, which may equal the celebrated blue grass.

Another variety (unless it may be the same as the multicole rye) is mentioned by Lawson, in his Agriculturist's Manual, called *midsummer* rye, and said to be valuable. It differs considerably from other varieties, in being later in coming to maturity, and producing larger straw, much longer ears, and more root foliage. In France, and other countries, it is often sown the last of June, and fed down by sheep during the fall and winter months, affording abundance of feed till April, when it is allowed to run to seed; and is said to produce a better crop of grain than in the usual manner. Thaer, the eminent Prussian scientific agriculturist, in his Elements of Rational Land Husbandry, also speaks of a variety of rye which, he says, was introduced from the Russian provinces on the Baltic sea, and which, perhaps, with slight diversities, is called by different names—Archangel, Norwegian, Wallachian, and Johannis rye, but which is more commonly known as the *bush* rye—which possesses the property of the winter rye in a particularly high degree. His account of it is, that "it has superior and undoubted advantages to other kinds. It is much stronger against the influence of the weather, gives out many more stalks, does not lodge so easily on rich soil, and always gives, on a good and well-tilled soil, a higher product. Only it must be put in the earth the first of September. By being sown later, and on poor soil, it loses its advantages. It shoots up, blossoms, and ripens decidedly later than the common kind; and only by a very early sowing can it be made to resemble it. This variety is very constant, and I have noticed no degenerating or mixing, even though it stands so close to others that the pollen mingles." He says further: "The bush rye requires to be early sown, and it cannot probably be sown too early. I have sown it on from June, without its making the slightest appearance of shooting forth in the same summer. When it is first sown in October, it gives out a few stalks, or its near shoots are held back on the bursting forth of the ears, and become weak." "If sown in August, or the beginning of September, it throws out its stalks so thick, that three-fourths of the plants must give way. In the spring, this rye has the appearance of standing too thin, and then the inexperienced might object to it that it has been too thinly sown; but it would stand thus if it were sown very thick, since the plants giving out stalks must crowd one another, and must have place, in order to gain a strong measure of stalk. It however puts forth afterwards, with ten, twelve, or more strong haulms, to the full height, and forms, if it has strength of soil and the weather is favorable, the thickest field of ears. As this rye germinates and shoots forth later than the common kind, its appearance in the middle of May is often compared with that far behind it, but in June it goes much before it." The amount of seed to be sown he states to be four and a half to five and a half pecks for the acre.

In an able agricultural journal, great advantage is said to result from cutting rye, as well as wheat, while the stalk is green, and before the berry gets hard and dry; and it is asserted that, thus treated, and well cured, it gives a flour almost equal to wheat.

The use of rye straw in England, for the manufacture of Dunstable bonnets, in imitation of Leghorn, has recently become an important branch of female industry, and deserves notice in our country. The mode of culture for this purpose is given fully in Loudon's Encyclopedia of Agriculture, under the article of rye. Rye also is said to be very valuable as a green fodder for sheep, for its early production, and for its producing milk for ewes. This subject is the more important, indeed, from the fact that, in

general, attention is turned to this grain as furnishing a good pasturage late in the fall, during the winter and spring, as well as a crop subsequently. Graziers now find that it is most profitable to make cattle their own harvesters as far as possible. Rye sown in June or July, or even August, will afford good food for cattle during the whole winter, when there is not a crust on the snow to prevent the cattle from obtaining it. It is a lamentable fact that fully 50 per cent. is lost in wintering stock at the west. Without shelter or much fodder, cattle fall away, and often perish; whereas, with a shelter and care, they require less food and straw. Besides, working cattle are thus in a good condition in the spring. This is one great cause why the same number in a team in the west cannot do more than two-thirds as much work a year as at the east.

The disease called the ergot in rye, or spurred rye, is well known to render it poisonous; and it is said that epidemics in the north of Europe have been traced to this cause.

BUCKWHEAT.

Buckwheat is confined to a few States—principally New England and the middle States. The crop is not raised by any persons in extensive fields, but in scattered patches; so that, though the aggregate forms a considerable amount, yet it does not show so much to the eye as to attract notice. Hence, the information respecting it, and the means of forming an estimate, are both more scanty and less reliable than with regard to many other crops. There was probably a slight increase in Maine, and in New Hampshire and Vermont a somewhat larger one. In Massachusetts and Connecticut the increase did not probably exceed five per cent., if it was as much. In New York, which ranks among the foremost States in respect to this crop, the information respecting it seems to justify the conclusion that it has fallen off at least twenty per cent. from the crop of 1842, which, as will be seen by a reference to the report for that year, was an increased crop in this State. Thus, it is said on high authority, as to western New York: "The weather, for some weeks, has been too dry; the yield will be light, though there are some good pieces on strong lands." It is said in some parts, also, to have been caught out by the early frosts, though the crop was a fair one. In Cattaraugus and Chautauque counties there was perhaps "a medium crop." In Steuben and Allegany "twenty per cent. less, owing to a wet fall." In the counties of Cayuga and Cortlandt the crop was only "middling." In those of Tompkins, Chemung, and Yates, the yield was an "average one." The same was the case in Madison and Oswego counties. In the Mohawk valley it was "very good." In the northern sections of the State the crop was probably "an average one." In the counties bordering on the Hudson river it was, in some, "a moderate crop;" in others, "a good deal cut off by the early frosts and snows," and thus "a poor crop." One whose means of information respecting this crop are better than ordinary, says of it, that there is "not more than half a crop. The quantity sown was comparatively small; and the crop was greatly affected by a severe drought, commencing in July, and continuing at the west through the months of July, August, and September; and in the eastern section of the State, with the exception of four or five river counties, till the middle of August." In New Jersey (which usually produces a large crop) it has probably fallen off thirty per cent. from the crop of

1842. Nearly the same deduction must be made in respect to that of Pennsylvania, which ranks first among all the States for raising buckwheat. It has here fallen off, according to the best estimate we can form, at least twenty five per cent. In some sections, as in the counties of Bucks and Lehigh, it is supposed to have decreased even fifty per cent.; while in the upper counties, on the northeast, it is said to have been an increased crop by twenty per cent. over that of 1842. South of these, and adjoining, there is said to have been "a large growth of straw, but it was not well filled." By the editor of an agricultural journal, the crop is estimated as about the same as last year; but a comparison of information from various sources renders it probable that this is too favorable an estimate. By another informant, speaking of the central section of the State lying on the Susquehanna river, we are told that "had it not been for the unusually heavy rains just before the filling, or in the blossom, the crop would have yielded twenty-five per cent. better than the last;" while another, in the southeastern section, gives it as his judgment that the crop there is "twenty-five per cent. less," and assigns, as a reason, "the hot sun in the graining season." Different causes of injury, probably, were more prominent in different portions of the State. In Delaware there was but little raised, but the falling off was twenty per cent. This crop attracts so little notice in many of the States further south, that no definite information can be obtained respecting it. In Kentucky the crop was good, though the season was too wet for it to be well saved; and, therefore, the increase was but a slight one. In Ohio, where more buckwheat is raised than in any other of the western States, the accounts are—that it was "very light, less by twenty-five per cent." than that of 1842, on account of the drought in the summer; "ten per cent. less," "twenty per cent. less," "about as in 1842," and "ten per cent. more." On the whole, a deduction of fifteen per cent. must probably be made from the crop of 1842. A similar falling off of ten per cent. took place in that of Indiana, though the notices respecting it somewhat vary. By some, the estimate made of this crop is, in parts of the State, "ten or fifteen per cent. more," "ten or twenty per cent. more," "a good crop," "as in 1842," "above average;" while others give it as having commonly failed, and "twenty per cent. below the crop of 1842." In Illinois the same estimate seems to be a proper one, as though some consider it to have been "a good crop," "about as in 1842;" yet it is also said, by a good authority, to have "suffered very much; and much of it was not worth the saving." In Michigan it likewise fell off, though not, perhaps, to the same extent. The crop was good, but, owing to continued rain in the fall, it was not well got in, and much of it was in the fields as late as the 20th of November.

The whole crop of buckwheat for the United States is, therefore, estimated to have been about 7,959,710 bushels.

MAIZE, OR INDIAN CORN.

As a whole, this crop, which is the largest and most extensively cultivated of any in the United States, during the past year was a good one. Different estimates are made respecting the increase in the State of Maine. By one, (a good judge,) the increase is rated as high as one-quarter more; and the reason assigned is, that there was "a long season of good weather to counteract the early effect of the wet, and the late rains were also ot service to cause it to grow rapidly." In other parts of the State it is

thought to have been about the same as in 1842. The increase, therefore, could not hence have fallen short of 15 per cent.

In New Hampshire it was not so great; probably there was but little increase over the crop of 1842. The various notices speak of it as "10 or 15 per cent. less than an average"—"about as in 1842"—"not quite so good as in 1842; perhaps one fifth of the quantity raised, owing to the backward spring. Much of the seed first planted rotted in the ground before the germination. The summer was also wet, and the autumn set in with frosts, which injured the crop to some extent." A person who has enjoyed opportunities for observation better than usual, says that, "though it suffered by frosts, it was, on the whole, equal to the crop of 1842." The early notices of this crop in Massachusetts mention that "the cold and wet of March and April made the farmers late in planting. The corn was not put in as early as last year, (1842,) by 10 to 14 days." In the latter part of July, it had grown rapidly for three weeks, and the appearances were good. In August it promised well, and had most of it recovered from the drought. The information since obtained is, that it was "a very good crop; better than that of the previous year"—"an average crop"—"very good; better than last year"—"5 per cent. increase." In Rhode Island, in some parts, on account of the severe drought from 25th of May to 17th of July, it is thought to have been "20 per cent. less;" while in others, it was "very good, and about the same as that of the year before."

The late cold weather affected it in Connecticut, as did the drought afterwards; but, on the whole, the crop was quite a good one, and there was a small increase above the preceding year. In Vermont, the crop is thought not to have been quite an average one. "It was of good quality," says our informant, "and the yield good in situations not exposed to the frost. The late and early frosts of spring and autumn, and the wet weather of the early part of summer, destroyed the corn in many parts of the northern section," and the crop is thought "not to exceed two-thirds of the usual quantity." The average, therefore, for the whole State, is estimated at 10 per cent. less than that of the crop of 1842. There has been a gain of probably 15 per cent. on the corn crop of New York. Our informant, with good opportunities to ascertain, after considerable examination respecting it, says there is even "20 per cent. more, and of a superior quality." This increase is attributed to "the increased quantity planted," and also to the "favorable weather, and very greatly improved system of cultivation." Another remarks that "it suffered much from late planting and the drought of summer, but recovered well in August, and is a full average crop." In Cattaraugus and Chautauque counties, it was "an inferior crop;" in Steuben and Allegany counties, "20 per cent. better," as the season was better for it than in 1842. In some of the central counties, from Onondaga to Montgomery counties, the notices vary like the following: "as in 1842," "full average crop," "ordinary as in 1842," "not equal to that of 1842," "the usual crop." In the northern section it is thought to have been "an average crop;" while in the eastern section, different estimates are made in different situations, as "middling," "20 per cent. better," and "20 per cent. worse."

The crop of New Jersey is said to have been a fine one—from 10 to 15 per cent. more.

Pennsylvania raises a large crop of corn, and the grain this year must be rated as high as 15 per cent. The information respecting different parts

of the State shows considerable diversity. In the northeastern section of the State it is set as high as "30 per cent. advance." In the central counties around the Susquehanna river, it is estimated as "10 per cent. better than in 1842; and, but for the drought, there would have been a large increase." "The frost," it is observed, "kept off, and the ears were generally well filled." "In quality, the corn was never better." In the eastern and southeastern sections, along the Delaware river, it is thought to have advanced in some parts "20 per cent.;" in others, "10 per cent.;" to have been "equal to the crop of 1842;" "somewhat injured by frost on the first of June, but the earing season was remarkably fi e." In the central section west, and along the Juniata river, it is thought to have fallen off "50 per cent." on account of dry weather; and in the southwestern section to have been "25 per cent. less than the crop of 1842." The corn crop of Delaware last year suffered so greatly, (in the year 1842,) that the advance in some sections has been estimated at even "more than 300 per cent.," as the season of the last year suited the swampy and low grounds, which were all flooded in the wet season of 1842; "a greater crop, indeed, than for 20 years." The highly favorable state of the weather, from June on, is also assigned as a reason for the crops being much better than for many years; as in the year 1842, owing to the backwardness of the spring and the wet weather, great distress was caused by the failure of this crop, especially in the counties of Sussex and Kent. Another estimate in another section is, "one-third more" than in the year before. In some other parts of the State, the crop is thought "not to have been equal to last year." The crop, as a whole, for the State, may be considered as more than double that of 1842. In Maryland, the cut-worm is said, in a notice in June, to have been at work on the corn; but at a later date, this crop is said to look well, and there was probably a considerable advance on the crop of 1842.

The notice of this crop likewise in Virginia, in June, was unpromising; but in the latter part of the month of July it was considered "very fine;" and the yield, according to later information, must be fixed probably at 20 per cent. advance for the whole State. Yet the accounts vary. Thus it is said that in lower Virginia it was "larger than the last year;" and the doubt is expressed, as to the counties lying between and around the Potomac and Rappahannock rivers, of its being a full average crop, as "the early drought of last summer diminished very materially the product of the corn first planted; the crop planted late, or on stiff cold land, the maturing of which was retarded, yielded more." In the southern central section, it is said to have been below an average crop. In the southeastern, it is estimated to have yielded "30 to 50 per cent. more" than in 1842, and to have been "uncommonly fine." The same judgment has been expressed with respect to the eastern shore, and near the York and James rivers; while in other sections it is thought to have been "not as good in quality as in 1842, but about the same in quantity; the season in June and July being very dry and very hot;" or a "good crop," "a fair, but not large one, owing to the backward spring, and severe drought in July." The increase for 1843 on the corn crop in North Carolina, South Carolina, and Georgia, according to the best data which can be obtained, was about 10 per cent.; yet in some sections it is thought to have fallen off "30 per cent. on account of the excess of rain," or to have been "better than in 1842, by from 25 to 30 per cent."

This crop in Alabama was not so good as that of 1842, according to ac-

counts received, by 10 per cent. In Mississippi, the backward season retarded the planting a month later than usual; yet it is thought to have been in different parts "equal with the crop of 1842," and "a very large crop." The increase was probably not far from 15 per cent. In Louisiana it was probably about 10 per cent. advance of the previous year. In Tennessee and Kentucky, which, it will be recollected, rank highest of all the States in the corn crop, the advance on the crop of 1842 could not have been less, by all accounts, than about 20 per cent. Some estimate it in certain sections as high as 30 per cent. The notices, however, vary. The following are some of these: In the southern sections of Tennessee, "much better than last year." In the southwestern part, "about an average crop."

A public journal, speaking of this crop in Kentucky during the summer, remarks, that "from Lexington to Louisville it is remarkably promising." In the central part of the State it is said to have been uncommonly fine—"20 per cent. above that of 1842, on account of the dry spring and wet summer." Around the vicinity of the Green river, in the lower part of the State, it is estimated as high as "one-third more;" while in the northeastern section it was "10 per cent. better, owing to the season." The editor of a valuable agricultural journal also says that "the crops are excellent—fully equal to last year." In some places, however, it is thought to have suffered from 10 to 20 per cent. compared with the average crop.

From Ohio, which also produces largely of this crop, the accounts are less favorable; though here, too, there is much variety in the information obtained. In the southwestern section it is thought to have been "an advance on the crop of 1842 of one-third. on account of a dry season and frequent showers, while last year it suffered extensively from a storm of wind." In respect to the upper central counties, the accounts given state the decrease at "20 per cent. compared with the crop in 1842, by reason of the wet spring and very dry summer." In the Sciota valley, also, this crop appears to have been affected by the extremes of wet and dry weather during the spring and summer, and "not above the average of last year." In the southeastern section the decrease is estimated as high as "40 per cent." In the central, western, and northwestern and southern counties, the decrease of the crop is variously estimated at "10," "20," and "25 per cent." as compared with that of 1842. On the whole, it is thought that the crop, taking the average for the State, must have fallen off at least 15 per cent. from the crop of the former year.

The corn crop of Indiana, it appears, by the best information obtained, was about 5 per cent. worse. In some sections of the State it was better, as in the southeastern, where the increase is estimated as high as "25 per cent. better," owing to seasonable rains, or higher; "10 per cent. more, but perhaps also 10 per cent. worse in quality," in consequence of extremely wet rains; and in the southwestern, where it is said to be "a good crop, somewhat over an average." In other parts of the State it is stated to have been "seriously injured by drought in July—25 per cent. below the average."

For the State of Illinois the estimate on the corn crop is, that there was a falling off of 15 per cent. The editor of an agricultural journal speaks of it as about the same in quality, but one-sixth less in quantity. In the counties lying on the Kaskaskia river, towards its mouth, the crop is thought to have been "25 per cent. better;" but higher up, and nearer to the centre of the State, owing to the wet spring and dry summer, it is estimated at "50

per cent. less. Of the central section, one informant says: "During the spring of 1843 it was very cold in the beginning, and wet in the latter part of the season. This was succeeded by a drought, which lasted from the 4th of June to the 1st of September—the roots of the corn never being entirely saturated with rain during that period; the consequence was, that the corn crop was short through the whole State, on an average, a third or a fourth." Still further east, towards Indiana, in counties bordering on that State, it is said likewise to have been "25 per cent. less, from the drought." In Missouri, on the whole average, the crop was a good one, and at a considerable increase over that of 1842. The corn crop of Arkansas was somewhat over an average one—perhaps 5 per cent. above that of 1842. In many sections it was injured by the drought, while in others the rains were quite seasonable. Many new lands brought under cultivation made the crop "to equal, if it did not exceed, that of previous years." In some parts, however, it is estimated to have been one third less.

From accounts respecting the corn crop in Michigan, it suffered from the drought. In different parts of the State it varied, according to the weather. In the southeastern section it is estimated to have been "one third less, on account of drought and heavy frosts;" in the northeastern and northern sections, "5 per cent. more;" while in the central portion of the State, some have thought that it was "very greatly above that of 1842;" and in the western and southwestern, bordering on Lake Michigan, it is pronounced to have been "not as good as in 1842, by 10 per cent., owing to the month of May being cold and wet, and June cold and dry, so that it was late before it commenced its growth;" though in portions of this section it was "good." On the whole, it is thought that a deduction, on an average, must be made for the State of 15 per cent. from the crop of 1842. There was a slight advance on the corn crop of Florida, Wisconsin, and Iowa, and the District of Columbia. The whole crop of Indian corn for the United States may, therefore, be set down at 494,618,306 bushels.

Among the varieties of corn, a singular one is mentioned as having come from the west of the Mississippi. Its peculiarity is in its making bread nearly resembling wheat in taste. An account of it, taken from the Farmers' Cabinet, will be found subjoined in Appendix No. 1. The variety of colors which it exhibits has procured it the name of *calico* corn. The excellence of Indian corn, as a green fodder, has long been acknowledged; but there is a diversity of practice prevailing as to the method of treating it. In the south, the stripping the leaf from the blade is more generally practised; but at the north, the usual mode resorted to is topping. As to the early cutting up of corn, it is said by good judges that the time for cutting it up is when the corn becomes hard and glazed in the centre of the kernel. One person recommends taking five rows through the field; the corn is cut up on either side, and carried on to the middle row for the row of stacks; then a hill is left standing to stack around, and every handful of corn cut is set down, heading at the bottom of the sack; and when this is of sufficient size, a handful of straw is taken, the tops trimmed down, bind it tight, and the work is done.

The subject of corn-stalk sugar will be found under the topic of sugar, further on.

POTATOES.

No crop during the past year has more generally suffered than that of potatoes; and yet the early prospects of this crop, as we gather them from the notices of the public journals and agricultural papers of the season, were highly promising. The difficulty in most cases does not so much lie in the less quantity contained in the ground, but in the worthlessness of a portion of those which became matured. The State of Maine has always excelled in the quality of the common potatoes raised there, as well as in the amount raised, which is second to none but New York. Large quantities have been raised in this State the past year, as we learn that more than 12,000 bushels were brought into Hallowell in one week, and sold for shipment. In some sections there was "a better crop than in 1842;" but in other parts, the falling off is variously estimated, by good judges, at "one-third to one-half less," on account of wet seed time, and the succeeding drought. The average decrease may be set at 20 per cent. for the whole State.

In New Hampshire the average decrease is still greater, and the crop was probably 25 per cent. less than that of 1842. By some, it is estimated at from "10 to 20 per cent. less," on account of the wet season. By others, at "25 to 50 per cent." There is also said to have been "rust on the top, and scab on the roots. Two early frosts were experienced before they ripened." They were in quality, likewise, "much inferior" to those of former years. The potato crop of Massachusetts, in some parts, is said to have been "better than that of 1842:" on the whole, "a good crop," and even "5 per cent. more," and an "average crop;" while by the estimate of others, owing to the drought, there were only "two thirds as many as the year preceding." "The early planted ones were generally very light, but the later did better." Taking the whole State, the average of 15 per cent. less cannot be far from the truth. In Rhode Island this crop is said to have suffered a severe drought, and the estimates respecting it in different parts of the State are from 20 per cent. to one fourth or one third less. Probably there was at least a decrease of 20 per cent. on the whole crop of the State. Similar causes also affected the crop of potatoes in Connecticut. From the information received, it appears that it was "not an average crop," as they were "affected by drought," which was severe in parts of the State. When the rains commenced, as they were then very small, many of them began to sprout; after which, they grew faster than usual. Besides, many bushels were flooded by the freshets of the Connecticut river, and were thus entirely destroyed. In quality, "the crop has not been so dry and mealy as usual, and in many cases there is a tendency to rot." The deficiency is thought to be at least 15 per cent. compared with the crop of 1842. In Vermont it was probably 20 per cent. "The crop was light, in consequence of drought in midsummer; and large fields in some parts were frozen in the winter, having commenced on the 22d of October by a hard frost and heavy fall of snow." In quality, also, they are said to be inferior, as in the other States mentioned above.

In New York, which stands far before any other State in the amount of this crop raised, the falling off was great—probably, not less than 30 per cent. The information received is quite full. From a good authority we are told, respecting this crop in western New York, that it is "light, owing to the dry weather;" only three moderate showers were experienced in more than four weeks, and the earth was greatly parched. Again, potatoes are said to

have "suffered greatly from drought in August and September, although some parts escaped; the average is less than half the crop of 1842, or of a fair yield. They are much raised for stock, but this year they will be wanted in market for human food and for seed. The protracted rains in October and November did much damage to the potato crop, and prevented the seasonable harvest; many bushels have rotted, and been frozen in the ground." The particular notices respecting the various portions of the State are generally unfavorable. Thus, in Cattaraugus and Chautauque counties, where this crop is extensively cultivated, it is thought that there was "not more than two thirds of a crop." In Steuben and Allegany counties it was "20 per cent. less, owing to the dry season." Along the central counties of the State, they are said to have been injured by the drought, "so that there is not an average crop," and "much injured by early freezing." In the northern parts of the State the information states that they were "one-third less," for the same reason of drought; "a small crop—much less than an average one—owing to the heavy rains that filled the earth, and washed the seed from the hills, and in many cases rotted it where it was left in the ground; also, the want of seasonable rains at a subsequent period." Those which were raised are likewise small, though they are said to have been "dry and very good." In the valley of the Mohawk the crop is thought to have been much larger, owing to a favorable season. In Otsego and Schoharie counties, however, the potatoes are said to have been "subject to a dry rot, attacking some in the hill and some in the heap, and fatal to the whole wherever it made its appearance, causing them to rot and to emit a very offensive stench. Those who undertook to feed them out after the rot commenced, found the injury to the cattle greater than the loss of the vegetables. Although the crop was originally good as usual, there will be a great scarcity of the article." In the eastern section of the State they were, also, "much lighter than usual, and somewhat diseased and rotted after being secured, owing to the unfavorable weather for gathering the crop." The estimate of the deficiency in some counties is even as high as "50 per cent.;" while in others it is about "12 to 15 per cent." "They have black spots, and rot in the hill and on the way to market."

One who is esteemed high authority on this subject, speaking of the crop, says that "through nearly the entire extent of the State, (and it is said, also, in portions of Connecticut, New Jersey, and Pennsylvania,) it is rendered almost valueless by a disease new to farmers here, which, in most cases, attacked the potatoes before they were dug. Many crops were worthless when dug from the ground; and almost all crops began to decay immediately after drying, and rapidly decayed till they were an extremely offensive putrid mass. The diseased potatoes are said to be poisonous, and to have caused the death of hogs fed upon them. In this section of the State the disease is not as universal as it is represented to be in other places. I have heard of no injurious effects from feeding them—my hogs have eaten them freely, uncooked, down to the present time, (December, 1843,) without injury." Another person, also, who enjoyed great advantages for ascertaining the condition of the crops, remarks, that "potatoes suffered greatly from the dry weather of June and July, and the early crop was a very light one, though good in quality. The later ones seem to have been injured by the long protracted rains of August, and through the fall, and did not sufficiently ripen; proved green and watery; and hence, in my opinion, the fatal disease among them. The early snows prevented their being properly gathered in

the northern and western parts of the State, and there has been a great loss in consequence." The potato crop of New Jersey likewise, as has been mentioned, suffered from the same cause; they were "of a very inferior quality;" the deficiency is estimated to have been "20 per cent." By some it is thought that the crop is even "one third less than an average one."

Pennsylvania in 1842 stood next to New York in the quantity of potatoes raised; and the crop there, as will be seen by reference to the report for that year, was a good one; but the past year there has been a very great falling off, and the crop is at least 30 per cent. less than that of 1842. The particular accounts correspond well to the general estimate. In no case have we heard of an increased crop, but the language, as applied to different sections, is—"nearly 50 per cent. less, owing to a rot which seized them before the time for taking them out of the ground;"—"50 per cent. less, owing to a rot produced by a long drought, followed by heavy rains;"—"75 per cent. less; they rotted in the ground when ripe, from a week's excessive heat, day and night, while the ground was constantly wet, from which fermentation ensued, except only in dry soils;"—"an average crop, but a total loss, owing to rot, supposed to be caused by the excessive amount of rain, and the extreme hot weather in August; the potatoes rotted in the ground to a great extent, the residue rotted after being gathered." Another says, "40 per cent. less, and the quality very inferior—spoiling." Another: "33 per cent. less, occasioned by dry weather." Another still: "25 per cent. less," and assigns a similar cause for the deficiency. The disease, mentioned above, seems also to have equally injured the crop in Delaware, as, according to the information obtained, although there might be, in some sections, perhaps, "a fair average," and even "a large one," yet, when they came to be gathered, they were not more than "one-half or three quarters of a crop," as they "rotted in the ground;" and so offensive, after being gathered, that it became necessary to remove them from the cellars.

The crop in Maryland was not so great as in 1842 by 10 per cent., nor in Virginia; but in North Carolina the crop was probably 10 per cent. more. The sweet-potato, it is well known, is the one principally cultivated here, as in the more southern States. In South Carolina, Georgia, Alabama, and Louisiana, the crop ranged from 20 to 25 per cent. more, in different sections of these States; on the whole, it may be estimated at an average of 20 per cent. advance. In Mississippi, however, there would seem to have been a falling off of 25 per cent., and the quality was inferior to the crop of 1842, which, as may be recollected, was a large one; others estimate the decrease as high as one-third, and the cause assigned is "the incessant rains in August and September, in which many rotted." The information from Tennessee represents the potato crop as "very good;" "20 per cent., or more;" "in great abundance." It seems a fair estimate to fix the general average for the State at "20 per cent. advance." A similar increase may be allowed to this crop in Kentucky, as it is said to be "a fine produce," "good," and "average."

The accounts respecting the potato crop in Ohio represent a large falling off from that of 1842, which was a "fair or good crop." There seems to have been a considerable diversity in the various sections of the State. One informant, speaking of the counties lying on the Ohio river, east of the Sciota, says that this crop "yielded better than was expected, and will not fall short of the last year's crop more than 10 or 12 per cent." The cause assigned is "the drought." In the northwestern part of the State, "the dry season"

caused it to fall off, according to the accounts received, "50 per cent." While the early rains drowned the wheat crops, as the soil is clay, the dry weather operated severely on the spring crops. In the central part of the State, between the Cuyahoga and Muskingum rivers, the crop is thought to have been "as in 1842;" while west of this, and towards the lake, the deficiency from the drought is set at "10 per cent.," on account of the "wet spring and very dry summer." In the southwestern part of the State, the decrease is estimated at "10 per cent.;" while in the southeastern counties, we are told that "many were planted in June, but after the drought did not come up and grow until late in August, when refreshing showers commenced, and the yield was probably about 60 per cent. The whole average decrease may therefore be fixed at 25 per cent. There was likewise a deficient crop of potatoes the past year in Indiana; though, in portions of the State, there seems to have been "about an average crop," and even "an abundant crop," "20 per cent. more than that of 1842," in a few counties bordering on the Wabash and White rivers; yet, in other sections, as in the northwestern part of the State, "the crop was injured seriously by the drought in July, and was 25 per cent. less than the average;" and on the western side of the State, adjoining Illinois, it was considered "indifferent;" in the southeastern counties "20 per cent. less than in 1842, having been injured by the rains." The average deficiency of the whole State, below that of the previous year, from this and similar information, would seem to have been about 20 per cent. The accounts from Illinois vary somewhat widely in different parts of the State; and notwithstanding one informant says that "except in a few places, where the drought was severe, the crop has been good in every part of the State," yet others say that it was "25 per cent. less," and "three-fourths less;" so that it must be estimated, probably, for the whole State at 15 per cent. decrease. The fact is evident, from another, that potatoes, which in Chicago, in 1842, sold for 12½ cents per bushel at the same period of the year the last year, have this season sold for 44 and 50 cents. In Missouri, probably, the potato crop fell off at the same rate. In Arkansas they increased, in consequence of more land cultivated.

The potato crop of Michigan is represented to have been a good one, and an advance on the former year of 15 per cent. The various notices speak of it as "about the same as in 1842," "10 per cent. more," "50 per cent. more," and "one-third less." In the Territories of Wisconsin and Iowa, the crop was probably an advance on the crop of the past year of perhaps 10 per cent. The whole potato crop of the United States may thus be estimated, as in the table, 105,756,133 bushels. The failure of seed potatoes has often occurred, and thus the whole crop for a field, or perhaps section of country, has been greatly injured. It is said that, in the vicinity of Philadelphia, "where farmers have planted from 1 or 2 to 10 or 15 acres, they have lost them almost bodily;" and, in some instances, 1,500 or 1,200 bushels have decayed after they were dug." In an agricultural journal of high standing, it is affirmed that "the potatoes which are brought from the eastward are occasionally so heated in the vessel, as to become unfit for planting." As an instance of this, "some very fine mercer potatoes were obtained on board a vessel from Maine. They were planted, but about one-fourth of them only ever vegetated." Johnston, in his lectures on agricultural chemistry, remarks, in reference to this subject: "The seeds of all cultivated plants are known at times to fail, and the necessity of an occasional change of seed is recognised in almost every district." He mentions, that in the

Lowlands of Scotland "potatoes brought from the Highlands are generally preferred for seed," and that "on the banks of the Tyne, Scottish potatoes bring a higher price for seed than those of native growth." He adds, that "this superior quality is supposed by some to arise from the less perfect ripening of the upland potatoes," and alludes, in conformity with this view, to the extensive failures which have taken place during the summer of 1843, and which "have been ascribed to the unusual degree of ripeness attained by the potatoes during the warm dry autumn of the past year." "This," he says, "may, in part, be a true explanation of the fact, if, as is said, the ripest potatoes always contain the largest proportion of starch; since some very interesting observations of Mr. Stirrat, of Paisley, would seem to indicate that *whatever increases the per centage of starch, increases also the risk of failure in potatoes that are to be used for seed.*"

Mr. Stirrat, whose letter on this subject may be found at length in Appendix No. 2, gives it as his conclusion, that "if farmers were careful in raising their own seed-potatoes from land that has lain long in a state of rest, or, where that cannot be had, by bringing new soil to the surface by trenching as much as is necessary, or by the use of the subsoil plough, failures of the potato crop, from the seed not being good, would become much less frequent." Professor Johnston, however, doubts "whether the relative proportions of starch are to be considered as the cause of the relative values of different samples of seed potatoes." He speaks of the value of saline matter, and says that it is "beautifully illustrated by the observation of Mr. Fleming—that potatoes dressed with sulphate and nitrate of soda, in 1841, and used for seed in 1842, presented a remarkable contrast to the same variety of potato planted alongside of them, but which had not been so dressed in the previous season. These last came away weak, and of a yellowish color, and, under the same treatment in every respect, did not produce so good a crop by 15 bolls ($3\frac{3}{4}$ tons) an acre."

The disease with which, as has been mentioned above, the potato crop has been attacked, has excited more than usual attention. The cause is generally attributed to the peculiarity of the weather. In one agricultural paper, we find the disease ascribed to a "premature ripening," which caused the first set of tubers to sprout for the second crop. In another, it is mentioned thus: "The cause of the disease, or sudden decay, has not as yet been satisfactorily accounted for. It has generally been attributed to their not ripening perfectly, and having been harvested prematurely. Our opinion, however, is, that it was caused by the superabundant moisture of the soil, in which they were allowed to remain too long. In support of this view, we would observe that, in one of our fields, which is low and of a retentive soil, we were compelled to leave a part of it for 10 or 12 days after the first part were harvested, before we could finish; and many of those last dug were affected, and soon rotted after exposure to the air. The tops of our potatoes, in one field, which were planted early, withered and dried long before we supposed the roots had ripened. They were dug early, and immediately stored in the cellar, with very little exposure to the sun; and no trace of disease, as yet, (December,) has been discovered; while others, in the same neighborhood, under the same circumstances, but left until a later period before they were dug, have nearly all been destroyed. It does not appear to be confined to any variety; but the pink-eyes and the mercers have suffered most. In some cases, where the diseased potatoes have been fed to hogs and cattle, death ensued."

In another able agricultural paper, we find the opinion expressed that the potato crop is almost a total failure; and the doubt is stated, if, in the general average of the entire country, the crop will turn out from one-fourth to one-fifth the usual product of former years. The editor says: "We have heard of several, which, on being dug, did not yield one-fifth the quantity which the ground appropriated to their growth should have produced." He further remarks, "of the cause there is no diversity of opinion. All refer the decay of the roots to the frequent heavy rains; and we apprehend that of the propriety of this reference there can be no doubt—as, from the superabundant supply of water thus afforded to the vines, the tubers were prematurely forced into ripeness; and the same cause, existing under a greatly reduced temperature of the earth, proceeding from its supersaturated condition, and the atmospheric heat arising from the obscuration of the sun, on reaching the point of ripeness, instead of commencing a *second growth*, (as would have been the case, had there been sufficient sunshine and heat to bring out germination,) the tubers commenced the process of decomposition weeks before the regular time of harvesting them; and, in many instances, were found to be so many masses of rottenness when they were attempted to be dug, throwing out such an intolerable stench, that, in several cases, we have heard the hands had to desist in digging them. Had these potatoes been dug just at the point of time at which they were ripe, there can be no question that they could have been saved from rotting." The remedy suggested is later planting than usual; for the late planted potatoes are said to have fared much better than the early planted. Another writer says: "It is a fact not generally known, that the cause of the failure of the potato crop last summer was not caused by an excess of rainy weather, so much as the manner of ploughing the ground to receive slips. Farmers who ploughed their fields deep, and those particularly who used the subsoil plough, had a full average crop, and were more than compensated by thus deepening and pulverizing the substratum; on the contrary, when the reverse was the case, two-thirds of the potatoes were found to be rotten, which was caused by water having no vent settling around them. The subsoil plough obviates this difficulty, and also, in event of a drought, allows the moisture to ascend, by which the plants are nourished, and an abundant crop realized." An eminent agriculturist also gives it as his opinion that the disease "is a fungus belonging to the vegetable growth, as rust and smut in wheat and corn, and mould, and mildew." He recommends "that all diseased potatoes be carefully taken out, and thrown away; and that, finally, pulverized *lime*, either slaked or unslaked, be sprinkled among the healthy potatoes, just enough to whiten their surfaces lightly." No experiments to this effect, of course, have yet been tried.

Another, also of high authority on agricultural subjects, writes: "Potatoes on old-ploughed highlands and alluvial grounds are liable to rust; in 1843, rust was more common and prevalent than usual. High pasture lands, without manure, yield the best potatoes; these do not fail to work well. Potatoes struck with rust before they are ripe, are invariably watery and unpalatable. This was the case with four-fifths of the potatoes at the lower end of the State. On high grounds, broken from the sod, the potatoes are always good. I this year raised 1,000 bushels nearly on 5 acres of alluvial swardland, where they were not injured by rust, and produced 200 bushels to the acre. These were planted in the sward, on a di-

rect line, between every third furrow. The manure was all spread upon the sward, which was cut and turned over to the depth of from eight to ten inches; the manure was all out of sight. The roots of the potatoes derived all their necessary aid from the manure, the whole strength of which, for future crops, was retained in the ground. The potato vines continued green until fully ripe. Will some curious observer describe the disease of rust, and prescribe the best remedy? Four acres of the above were stirred with the subsoil plough, eight inches below the turning over of the surface-plough, making sixteen inches in depth."

A gentleman, to whom we are indebted for much valuable information, mentions that he heard, two or three years ago, from one of the foreign ministers in this country, that a similar disease had attacked the potatoes in his country; but, as yet, we have been unable to find any notice of the same in any European publication. We find the following description of the appearance and progress of the disease in an agricultural journal: "The pink-eyes are almost universally affected. The disease first manifests itself by a black spot on the surface of the potato, which rapidly spreads, till the whole root becomes soft and worthless. Many farmers have lost their entire crops; the disease, in many cases, destroying the roots while in the ground; and in others, the potatoes, after having been carefully stowed away in the cellar, apparently free from disease, and sound, in a few weeks were thrown away, utterly lost."

Again, another person says: "The potatoes, when dug, appeared to look as fine as usual; but, when put in heaps in the field, and covered as usual, they become a rotten mass. In a dry cellar they hold their usual appearance tolerably well, except somewhat darkened, and a little shrivelled; but, on breaking them open, it was found that their surface, about a quarter of an inch in thickness, was of a dark-brown, and some of them entirely through were of the same color." On feeding his hogs with them, he soon found that "they began to cough, pant, and appear as if worried in a hot day; in about a week after they were taken, they refused to eat; and finally, after a few days, died—no doubt from their having been fed on these diseased potatoes."

Another gentleman, in writing on the same subject, says: "This disease has spread through the whole of this crop with an amazing rapidity, from one potato to another, until the whole are more or less affected. I have frequently seen a small, dark, mortified kind of a spot, the size of a finger-nail, on the potato, whence issued bubbles of matter; soon the potato would be entirely soft, filled with yellowish matter, slimy, and somewhat resembling the rot of an egg. The touch of other potatoes would spread the disease through the whole of them."

We have thus given the best information we have been able to collect respecting this singular disease in this important crop. It will be seen by the crop of another year whether it is merely occasional, and owing solely to the rains or heat, and confined to the season, or something more permanent. A disease, called the *curl*, has extensively prevailed among the potato crop in England, and called forth many communications and directions for its cure; but our own country, as yet, has suffered but little from that cause.

A plough to dig potatoes was exhibited at a recent fair in New York, which attracted much attention. It is represented to be capable of digging in a complete and clean manner six acres per day (or from fifteen hundred to two thousand bushels) with the same ease with which a single hand, with

the hoe, will dig fifty bushels per day. Frozen potatoes are usually supposed to be unfit for use; but if they have not been permitted to thaw, and if they are at once, while frozen, thrown into a kettle of boiling water, the frost being in them, they are said to be equally as palatable and nutritious as those which have not been frozen.

Few persons are probably aware of the quantity of potatoes used in our own country and elsewhere in the manufacture of starch, arrow-root, and tapioca, &c. The starch manufactory in Mercer, Maine, is said to have manufactured one hundred and forty thousand pounds of an excellent quality, grinding about sixteen thousand bushels of potatoes. The account from which this is taken says, further: "We learn that they have made arrangements to grind twenty-four thousand bushels of potatoes the coming winter, which will produce more than two hundred and forty thousand pounds of starch. They sell the commodity in Boston for about four dollars per hundred. The New England manufacturers prefer it to Poland starch." Another manufactory is mentioned in Hampden, which consumes "2,500 bushels per day." In a single district in Bavaria, in Germany, four hundred thousand pounds of sago and starch are manufactured from potatoes: one hundred pounds of potatoes are said to give twelve pounds of starch. The following extract from an agricultural journal presents some particulars relating to the quality of starch contained in various kinds of potatoes:

"Some years ago we experimented upon three varieties which we had, viz: the long reds, the Philadelphia, and the pink-eyes. We found that the long reds produced the most starch to the bushel. We think that they yielded a little more than six pounds per bushel, and the others not so much."

The following table we take from Accum; it gives the rate per cent. A bushel of potatoes weighs about sixty-four pounds:

Sort.	Fibrine.	Starch.	Vegetable albumen.	Gum.	Acids and salts.	Water.	By whom analyzed.
Red potatoes - - - -	7.0	15.0	1.4	4.1	5.1	75.0	Einhoff.
Red potatoes germinated - -	6.8	15.2	1.3	3.7	-	73.0	Do.
Potato sprouts - - - -	2.8	0.4	0.4	3.3	-	93.0	Do.
Kidney potatoes - - - -	8.8	9.1	0.8	-	-	81.3	Do.
Large red potatoes - - -	6.0	12.9	0.7	-	-	78.0	Do.
Sweet potatoes - - - -	8.2	15.1	0.8			74.3	Do.
Potato of Peru - - - -	5.2	15.0	1.9	1.9		76.0	Lamped.
Potato of England - - -	6.8	12.9	1.1	1.7		77.5	Do.
Onion potato - - - -	8.4	18.7	0.9	1.7		70.3	Do.
Voigtland - - - -	7.1	15.4	1.2	2.0		74.3	Do.
Cultivated in the environs of Paris -	6.79	13.3	0.92	3.3	1.4	73.12	Henry.

Mr. Wright, an English writer on the subject, recommends the employment of large tubers for seed. He remarks: "My opinion is, that more than a thousand bushels of potatoes may and will be obtained from an acre of ground." A writer of high character in our country also says: "I have the highest authority for saying that four thousand bushels of potatoes have been grown in Germany on five acres of land."

It is well known that there is a difference in the parts of the potato as used for seed. An experiment on this point is mentioned in some of the

agricultural journals, in which the seed potatoes were cut into four equal parts, and the butt end, seed end, and two centre pieces were separately planted. The result was, from the butt end were raised forty pounds, from the seed end sixty-two pounds, and from the centre pieces together one hundred and sixty pounds—showing the superiority of the centre pieces by fifty-eight pounds in the quantity planted, probably owing to the greater nutriment afforded. Whole potatoes are better than the eyes only for seed.

The following experiment for raising potatoes in the winter, without great care or cost, in the open air, is mentioned in the Berlin Polytechnic Archives as having been tried with success at Frankfort on the Maine:

"On the 26th of July and 1st of August of the former year, two fields were planted with potatoes from three-fourths to one foot deep, and one and a half to two feet from each other; which, after they were hoed and hilled, blossomed in the end of October. When the cold weather began, the stalk was cut off half a foot high above the earth, and then it was placed in one place with leaves and manure, and covered in another with some straw; and, lastly, some earth was thrown it. In both places the potatoes were gathered on the 10th of March; they had a perfectly fine appearance, and were of good taste."

HAY.

The weather, which proved so injurious to many of the preceding crops in the early season, appears to have been favorable to that of grass, so that the product of hay is larger than usual, and in many cases is spoken of as of very fine quality. The amount gathered in New England the last year, probably nearly reached a quarter more than in 1842. In Maine, in several sections, it is estimated at "one-third heavier; the quality is also good, as the weather was favorable." Again, the estimate by another is "one-third more—not injured by the early wet season, and harvested before the latter rains;" and by another still, "one-third more; the rains of last fall set the hay and grass uncommonly well; the snows prevented any winter or spring killing." In another section the estimate is less, as it is said "as good as last year, and may be 10 per cent. better." On the whole, it is thought it will be near the truth to fix the average for the whole State at 25 per cent.

The hay crop of New Hampshire was much larger than in 1842, and the rate of increase may be estimated for the State at 20 per cent. The notices respecting it in different sections speak of it as "very abundant—never more so, and of very good quality. One-fourth more was cut this year than the last;" "20 to 25 per cent. more in quantity, caused by late snows and a wet summer;" "33 per cent. more;" "a good crop—increase 10 per cent."

A similar account is given of the crop of hay in Massachusetts. Some of the notices of it at different times run thus: "Good, in some parts; in most, middling—except the soil is light; larger than usual, and than in 1842; very abundant where the land is in a good condition; the season remarkably favorable for securing it;" "in Worcester county unusually fine;" "the quality is far better (in this long spell of dry weather) than that grown in the rain; there is a richer green on the stalk, that is savory and nourishing for the cattle. Such hay, so grown and harvested, feels heavy when it is dry, and a far less quantity suffices than in other cases. The

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cost of harvesting is also very greatly reduced." In the southeastern section of the State it is thought "not to have been so large as in 1842—perhaps 15 or 20 per cent. less in quantity, but better in quality." In another section it is pronounced to be "a good yield, but a little less than in 1842." In the central part of the State the estimate is "25 per cent. more." Another good judge, speaking of the crop generally, says that it was "very good and well secured; 15 per cent. more than in 1842." On the whole, the average may be fixed at about 20 per cent.

In Rhode Island, by the accounts, the crop must have fallen off from 20 to 25 per cent., as compared with the previous year.

In Connecticut it was about "an average crop;" in some parts "light along the seashore," and a very good crop in other sections. The average might have been 15 per cent. better.

This crop in Vermont, in the northern part of the State, was unusually good; "the crop very large," and its increase over that of 1842 has been rated as high as 50 per cent., especially in newly stocked grounds. In the southern section it was also "a fair crop, though, perhaps, somewhat injured in harvesting." The general increase for the State was probably about 25 per cent.

There was considerable diversity, according to the information obtained, in the amount of this crop in different sections of the State of New York. It is considered, on the whole, to have been a fair crop—"10 per cent. larger than in 1842, and the quality unsurpassed." In the valley of the Mohawk it is said to have been "50 per cent. better" than in 1842, as "the season was favorable;" and again, in another part, "equal to that of 1842." In the eastern portion of the State, in different counties, the estimates vary from "very good—20 per cent. and more," "10 per cent. better," to "20 per cent. less," "half a crop, owing to an early drought." In other counties, (as in Tompkins, Chenango and Yates counties,) it is estimated to have been "a fair average crop, but in some sections light." In the counties lying north of these, in the central part of the State, it is also said to have been "a good crop—full average." In the northern section, likewise, it was "a good crop." In a part of western New York, as in the southwestern counties, the crop was "a first-rate one." In other counties in the northwestern, it is said to have been "one-third less than in 1842." Taken as a whole, in western New York, the editor of an agricultural journal estimates it to have been "a good crop—equal if not superior to that of 1842." Another, also, speaking of the whole State, says: "From the dry weather in the south part of the State, and, in fact, all along the Atlantic, it proved a light crop, and not within 25 per cent. of the average. West and north they had rains when dry here, and it proved a good crop." It is probably, therefore, a fair estimate for the whole State to fix it at an increase of 10 per cent. above the crop of 1842.

In New Jersey the decrease of the hay crop is variously stated at "10 to 50 per cent., owing to the drought;" 20 per cent. less, for the average of the State, would appear to be nearly correct.

The same cause produced a similar deficiency in Pennsylvania, which, as will be seen by reference to the report for 1842, had then a large increase above the former year. In the southeastern section the decrease is estimated at "33 per cent., as the spring was wet and cold, followed by drought, and the ground became hard and rigid." In the central counties, bordering on the Susquehanna river, it was "10 per cent. less, as there was too much

dry weather;" while on the Juniata river, and further west, it is thought to have been "equal to the crop of 1842." In the northeastern section there was thought to have been "an increase of about 10 per cent." In the eastern counties, on the Delaware and Lehigh, the deficiency is set as high as "50 per cent." The crop of Lancaster county is thus described in an agricultural paper in August last: "Grasses, (especially clover,) unusually light; not more than one half the quantity cut, but made in a fine condition;" "not more than two-thirds or three-fourths of an average crop." One whose opportunities of judging are better than usual, while admitting that the quality is superior, estimates the crop of the last year for the whole State at 20 per cent. less than that of 1842;" which is probably correct.

The same estimate will correspond to the accounts from Delaware; for, though in some sections it is thought to have been an average crop, yet in others, the crop of hay is supposed to have been "very short;" "one-third less;" "half a crop;" "generally short—one fourth to one-third."

The amount of hay raised in Maryland, Virginia, and North Carolina, was probably an increase of 10 per cent. over the crop of 1842. In South Carolina, Georgia, Alabama, Mississippi, and Louisiana, it forms comparatively a small crop, and the increase was not over 5 per cent. The accounts from Tennessee represent it to have been unusually fine—"the meadows yielding superabundant crops of the best hay;" so that the advance may be estimated at about 25 per cent. A similar intelligence comes to us respecting this crop the past year in Kentucky, where the estimates speak of "a medium crop," "as in 1842," and even "one-third more." The increase may be fixed at 25 per cent. for the average of the whole State. In Ohio, where it is a larger crop than in most of the States, the accounts inform us that, in the section lying on the western end of Lake Erie, there was 10 per cent. more; while still further west there was a falling off of about the same per centage. On the border of Illinois, it was an "average crop," "as good as usual;" in the Sciota valley, "never better—it got such a start in the spring, and was little injured by the dry weather;" while in the southeastern section of the State there was "a full average crop, and harvested in the best order." By other estimates, the State is thought to have yielded at least "a usual crop;" probably there might have been an advance of 10 per cent.

The grain of this crop in Indiana may be estimated, in view of all the information obtained, at 15 per cent. The crop of hay on the branches of the White river is said to have been "much as in 1842;" and northward, on the Wabash, "above the average." In the southeastern part of the State, "20 per cent. better"—"20 per cent. above the average." The average increase for the whole State may have been 15 per cent.

The information obtained respecting this crop, also, in Illinois, represents it to have had "a small advance—perhaps 10 per cent." It is called "a good crop," and said to be "better than usual"—"a little more than in 1842;" "same as last year;" "rather lighter than usual, though a good crop." The same ratio will probably indicate the crop of hay in Missouri, and a somewhat less increase in Arkansas; while in Michigan there was a gain on the crop of 1842 of probably 25 per cent. The notices from this latter State represent it as reaching, in some sections, as high as "50 per cent.;" and it is said that "the month of May was cold and wet, and it grew thick and strong, and then the dry weather did not much injure it."

There was, probably, a small advance in Florida and in the District of Columbia; an increase of perhaps 10 per cent. in Wisconsin and Iowa. The whole crop of hay for the United States, as it appears in the table, is 15,419,807 tons.

Some varieties of grass are mentioned as worthy the attention of farmers or planters in different sections of the country. The musquito grass is recommended in an agricultural paper at the south, as promising to be of value in furnishing a green pasture for winter, and in making hay in Louisiana and in the warm latitudes. The account given of it is, that it is said to have been brought from Texas—originally a native of South America. The advantages of it are, that it grows to a great height, continues to grow all the year, and will flourish on any soil.

Of the *gama* grass, it is said that its green crop is "from 15,000 to 20,000 lbs. to the acre; that it is most excellent for milch cows, causing them to produce milk and butter; that it is used as a soiling crop, and cut every thirty days; and from 4 to 5 cuttings may be obtained in a season, from 36 to 42 inches high." Some further accounts of this valuable kind of grass will be found in Appendix No. 3.

The *tussac* grass was found in the Falkland islands. By the accounts given of it, it appears to be a gigantic sedgy grass, the blades of which average 7 feet in length, and three-quarters of an inch in width—the plants growing in bunches; 250 roots springing from one bunch. Another species, called the *arundo* grass, is also spoken of. A full account of these grasses may be found in Appendix No. 4.

Professor Dewey states that there are more than 1,800 species of grass, which have been described by botanists; of which more than 300 are ascribed to North America, and more than 200 are found in the State of New York. Some fine varieties common in England have, as yet, been only partially introduced into this country. Experiments were made under the patronage of the Duke of Bedford, by G. Sinclair, esq., on more than 100 varieties or species of grass; the results of which were published, and these have formed the basis of the improved culture of grasses in that country. Some of the species which are recommended for trial more fully in this country, are the orchard grass, perennial rye grass, Italian rye, meadow fox-tail, meadow fescue, tall fescue, and tall oats, and sweet scented grasses.

Mr. Sanders, of Kentucky, in reply to a letter of Judge Beatty, commends the orchard grass very highly. He says the seed should be sown "early in the spring, as soon as the ground can be prepared, after it is freed from the frost.. If sown in the fall, though it may come off well, it may be killed by frost the first winter. One bushel of seed, uniformly cast over the ground, is sufficient for an acre. The second summer it yields a good crop of seed—from 10 to 15 bushels per acre, and often more." Some of the advantages of it are, that "orchard grass pastures are ready to afford stock a *full bite* in the spring 10 or 12 days sooner than blue grass." "When grazed down in summer, and the stock taken off, it will be in a condition to receive stock again in less than half the time than blue grass on good ground in warm weather. Orchard-grass, being fresh cut will grow more than an inch in 24 hours." "It will stand a long and pinching drought much better than any other grass." All kinds of stock are said to be very fond of it; and sheep will pass over every other kind to feed on it. Its properties in the above are attributed much to its abundant strong roots.

The tall fescue grass, according to Sinclair's experiments, stands the highest of all, in nutritious matter, when cut at the time of flowering.

The full trial of lucerne and sainfoin in parts of our country, together with spurry and tares, which are found so productive and highly esteemed in Europe, might prove them equally valuable to our farmers.

An interesting letter on the subject of raising grass will be found in the letter of Mr. Pell, contained also in Appendix No. 4.

FLAX AND HEMP.

The same difficulty has been experienced this year in arranging these crops as alluded to in the former reports. As the distinction between tons and pounds was not given in the original census statistics, it is very difficult to fix the estimate with even tolerable accuracy. There was a considerable falling off of these crops in most of the States. The flax in New Hampshire is said to be "inferior—not more than three fourths of a crop;" the causes of its failure were unknown, but "probably it was owing to the wetness of the season." It some other parts of the State, however, it is thought to have been equal to the crop of last year.

In the State of New York the crop has advanced. This is partly owing to the fact that the farmers of Seneca, and some other counties, have been induced by the proprietors of two oil-mills to sow about 1,000 acres of fax for the seed; the yield is said to be from 10 to 15 bushels per acre. The increase is thought to be as high as 15 or 20 per cent. In New Jersey the falling off of the flax crop was "from 50 to 75 per cent.," and it is said to have been "almost an entire failure." In the other middle and southern States, generally, there was an advance on the crop of 1842, of from 5 to 10 per cent.

In Mississippi the cultivation of hemp is said to be increasing. The product raised is about one-half a ton to the acre; whereas, in Kentucky 800 lbs. is esteemed a good crop. One planter, who in 1842 raised 3 acres, intended to put in 15 acres for 1843. Still the crop for the past year is said to have been short, compared to what it might have been had the season been more favorable. The hemp crop of Tennessee was probably a small increase above that of 1842—perhaps 5 per cent. Kentucky is considered foremost in its crop of hemp. The accounts respecting its production for the past year in this State represent it as in some parts a medium crop, selling for $3 to $4 per 100 lbs. In other sections, it is thought to have been not an average crop, and "one-third less than in 1842," principally owing to the heavy rains and hail-storms in the spring; the decrease from these causes is estimated to have been as much as 15 per cent. In Ohio the crop of flax and hemp is considered to have advanced 10 per cent. From some parts, the information received placed it as high "as 20 per cent.;" while, in others, it was reckoned "about the same as in 1842." More is said to be raised for seed than for lint. In Indiana the accounts vary; the flax in the southeastern part of the State is pronounced to have been "a good crop;" while on the western side of the State, near the Wabash, both flax and hemp failed. In the southwestern section it is thought to have been "20 per cent. more," and in the northwestern "25 per cent. short, owing to the drought." Not a great deal of either flax or hemp is grown in Illinois; in some parts the crop was "an average one;" "a fair crop;" "good." In other sections of the State, however, the information is more unfavorable.

Our informant says: "Recently much attention has been bestowed on the raising of hemp. No part of the United States is superior to Illinois for this production. I was born and educated in the best hemp county in Kentucky; and I am satisfied the same number of hands can tend more hemp in Illinois, and prepare it for market, than in Kentucky. Owing to the drought last year, the crop was lighter than usual, rendering it almost one-third below the average. The hemp is now transported chiefly to St. Louis; but manufacturing establishments are now beginning in Illinois, which will consume a portion of what is raised in that State. Should a machine be found which will answer the purpose of breaking the hemp cheaper than it can be done by hand, Illinois will soon raise more hemp than any other State in the Union." The whole average decrease for the State was, probably, 10 per cent. The crop of hemp in Missouri, though not as large as might have been hoped for, has somewhat gained on the previous year. In a public journal, in September, we find the following notice: "The hemp crops in this section of the State are proving to be much better than was anticipated some time since; many crops, since cutting, have been found to be nearly, if not quite, as good as they were last year. The crops in the prairies are, to some extent, a failure; but, in the rich timbered lands, they may be considered good." In some parts of Michigan there was more flax sown than before—even double that of last year—and the crop was good; but in others it fell short, owing to the dry cold weather in June: probably there was, on an average, a small increase. In Wisconsin it was an average crop; while in Iowa, it is said to have been uncommonly good, and has been estimated at an increase of 25 per cent.—which seems too high; the whole average may have been 10 per cent.

The whole aggregate of these crops raised, as appears by the tabular estimate, was 161,007¾ tons (or pounds.)

A species of flax is mentioned as growing in the Territory of Oregon, which is described as resembling the common flax in everything except that it is perennial. The natives are said to use it in making fishing nets. The roots are too large, and run too deep, to be pulled like the common flax, but fields of it might be mowed like grass; and if found to succeed, it might be raised without continual cultivation. Perhaps, it may be worthy a trial to introduce it among us.

A variety of hemp, also, which is indigenous, called the Indian hemp, is described in a scientific journal in 1826. It is said to grow profusely on our low lands. Its blossoms, like those of the silk weed, are purple, and the pods contain a quantity of silk, though less than the silk weed; but the coat of its stem is far superior in strength to the hemp. The gentleman who communicated an account of it to the New York Society for the Promotion of Useful Arts, in 1810, observes: "I caused to be water-rotted a considerable quantity in 1804, and obtained an excellent hemp as white as snow, remarkable for its strength, which proved to be double that of common hemp. I have been informed that the Indians who formerly inhabited the land where my plantation is situated, on the east bank of the Hudson river, made great use of this plant; and not many years ago, were still in the habit of coming from the distant place, where they now dwell, to collect it. Several of my oldest neighbors have assured me that the ropes and yarn which they made from the fibres of that plant, were far superior, for strength and durability, to those made of flax and hemp."

The plant, being perennial, could be cultivated and multiplied to the great-

est advantage; and being more natural to low and overflowed lands, could render productive certain pieces of ground which are now wholly unprofitable. It is further said to grow common in every section of the United States—"along watercourses, ditches, and borders of cultivated fields, flourishing best where agricultural operations have disturbed the soil;" and to grow "from 2 to 6 feet high, the stem straight and bare, of a greenish red;" and the writer who mentions it in a western agricultural journal, says, also: "I have never seen it grow with such luxuriance in any region as on our bottom prairies." A suggestion is also made as to a trial of its capabilities as a cultivated crop.

Bologna hemp is cultivated to a considerable extent in Kentucky. It is more easily broken than common hemp, is of a white color, finer, and stronger. The trials which have been made of American hemp, as compared with Russian hemp, are said to have resulted very favorably for that raised in this country. The great difficulty experienced, still, is in a suitable process of water-rotting, to render it adapted to the purpose of the manufacturer. An account of a process adopted in Kentucky may be found in the Appendix No. 5, contained in a letter from the Hon. Henry Clay to Bernard Myers, esq , a gentleman who has taken great interest in its culture in that State. This hemp is elsewhere stated to have been sold at the rate of $190 per ton.

The report of experiments making in this city, under the direction of the Secretary of the Navy, together with the translation from a recent Russian work published by Congress, will probably do much to obviate this difficulty; as the appointment of agents in the hemp-growing States for the purchase of the product for the American navy will encourage its cultivation, by bringing the market nearer to the growers of this crop. In the report of C. M. Keller, 1st examiner, accompanying the report of the Commissioner of Patents at this time, will also be found some remarks on hemp-brakes which deserve attention. The essays of Judge Beatty, of Kentucky, on the culture of hemp, which have been published in the American Agriculturist of New York, prove that we can find no difficulty in the culture of this crop, and furnish the best information, perhaps, which can be obtained in the same compass. At the same time, the older experience of European countries in the processes of preparing it for use is yet desirable, as nothing but the existence of this difficulty is likely to prevent our farmers from engaging extensively in raising it.

The Louisville Journal states that 14,000 tons of hemp were produced in Kentucky the past year. From this it required 8,500 tons to supply her factories, which manufactured 6,500,000 yards of bagging, and 7,000,000 lbs. of bale rope, sufficient to rope and cover 1,100,000 bales of cotton. This leaves Kentucky 5,500 tons of hemp for exportation, which, if properly rotted, would bring $190 to $200 per ton.

This, it will be seen, is a larger estimate than we have felt compelled to fix upon it, from the general information obtained respecting the crop in the State. What the data may be on which it is based, we cannot say. The amount of hemp and cordage imported into the United States from 1838 to 1842, according to official report, was:

2,374,373 lbs. of untarred cordage, valued at - - -	$113,024
7,665,226 lbs. of tarred cordage, valued at - - -	451,673
2,735,733 lbs. of twine and packthread, valued at - -	550,598
41,769,056 lbs. of hemp, valued at - - - -	2,620,409

These are according to the custom-house returns; at least 40 per cent. must be added, to give the entire value to the market. It will be seen, therefore, that there is room for a vast increase of the cultivation of hemp in the United States. Russia is said to raise 120,000 tons, one-half of which she exports to other countries.

The number of square yards of canvass for our navy is calculated at 369,431. All this is now said to be made of American materials, but the cordage is still made principally from Russian hemp. Much valuable information on the subject of hemp and flax may be found in the series of the Kentucky Farmer and the American Farmer, two excellent agricultural journals published in Kentucky and Maryland. The application of the machine for reaping wheat to the cutting of hemp, is said to have been very successful in Kentucky; with four stout horses, a driver, and a man to attend the machine, and six men to follow it, and remove the hemp from the track of the machine, it will cut 10 acres in a day.

Our imports of flax-seed are very considerable. A ship is noticed as having recently arrived at New York from Calcutta, having 20,000 bushels of flax-seed on board.

TOBACCO.

The tobacco crop of the past year seems to have suffered greatly in the principal tobacco-growing States. The amount raised, therefore, has fallen much short of not merely an average one, but even of the poor crop of 1842. So little is this crop cultivated in the States north of Maryland, that scarcely any notice has been taken of it in the agricultural or other public journals. In Connecticut, in some few towns of Hartford county, considerable attention has been directed to it for a number of years past. A ton and a half to the acre is said to be no uncommon yield. The crop has sold for six cents per pound. The tobacco is planted very thick, two feet and a half each way. The seed came originally from Virginia. It is cured in houses, without having been yellowed in the sun, and without the use of fire. It is said that the best Havana cigars (as they are termed) are often manufactured from mixed Cuba and American tobacco, and sold under that name in Connecticut.

In Pennsylvania the dry weather operated unfavorably on the tobacco crop, at the proper time for cutting out the plants, and caused a decrease of at least 10 per cent. from the crop of 1842.

The same cause was very destructive in Maryland, which usually produces a large quantity of tobacco. The notices respecting it, at different periods, are like the following:

"The crops in Calvert and Prince George counties are almost destroyed by drought." "The crop is both short and of a very inferior quality; not more than two thirds of the usual quantity, and far below in quality that of preceding years. The failure of this crop is attributable to the unusually cold and backward spring, which greatly retarded the growth of the young plants in the nursery beds; and to the dry weather in June and July, which rendered it impossible to set the plants in the field before August; after which, there was not time for them fully to mature before the approach of frost obliged planters to house the crop; when, again, the cold damp weather of the middle and latter autumn caused it to cure of a green or any dark color; besides which, the horn worm, the peculiar enemy of the

tobacco-plant, was never before so numerous and destructive as it was during the last season." Similar complaints of the injury done to the crops from the excessive floods and cold, during the same season, are made on the eastern shore. Some idea of the severe cold of the early part of the season, in this State, may be formed from the fact mentioned in one of the public journals, that on the 2d of June the brick-yards in Baltimore had ice on them. The decrease of the crop was probably full 25 per cent. on an average for the State.

An idea of this crop, the past year, in Virginia, may be gained by the following notices respecting it, during the periods of its growth and since. In July, it is said in one of the agricultural journals: "The weather for the growing crop of tobacco is as favorable as could be desired." One of the public journals in the State, in September, remarks: "One of the editors of this paper has travelled over the main part of the tobacco-growing region of Virginia, and, from all the information he could gather, he thinks that there cannot be a half crop of tobacco made this year. Lack of plants and good seasons in the spring, and the first part of the summer, prevented the planters from planting the usual quantity by at least one-third; and in the country where the crop was most promising, the late protracted rain has caused it to *fire* very much, and drowned large quantities on flat lands, having caused many planters to cut their tobacco green, and thus diminished the quantity of tobacco more than one-third." Again, yet later (in November) we find the following remarks in an agricultural journal: "The tobacco of Virginia has been materially injured by the frost. Last year, the tobacco crop reached 50,000 hhds. This year, it is estimated at the same quantity, but greatly superior in quality, though much injured by *firing*." Other information has been obtained like the following: "below the average;" "in the State, below an average crop in quantity, one-third, and as much so in quality. In consequence of failing to produce an adequate quantity of the superior qualities the last two years preceding, inferior qualities from other portions of the country have been substituted at lower prices; whether, after a good crop, this will continue, is to be seen." The cause of the failure of the crop the past year, it is added, "is owing to the scarcity of plants, on account of the fly and the lateness of the spring; the want of seasonable rains to set out the plants, until too late a period; floods during the summer, which washed away much tobacco on the borders of small streams; and too much rain at a time when drier weather was required to secure the tobacco." Though some of the above accounts seem to be conflicting, yet the general bearing of the whole seems to authorize us to fix the average decrease for the State, from the crop of 1842, at least 30 per cent. In North Carolina, and the southern States generally, though the tobacco crop did not suffer in an equal degree, there appears to have been an obvious falling off—probably not less than 10 per cent.

Tennessee raises a large crop of tobacco, and seems the past year to have had an increased crop, estimated at 20 per cent. In the notices of it in August, it is said to "promise finely;" and in some sections, it is rated as high as "25 per cent. advance."

The information respecting this crop likewise in Kentucky, which usually ranks as the second State in the production of tobacco, represents it as an increased crop. One informant, in the southwestern part of the State, says that "there was a quarter more planted," but it was "far from being uniformly good." Another, in the southern central region, estimates it at "one-

third more and better" than in 1842; and yet another, in the northern central section, pronounces it "10 per cent better;" others, also, speak of it as "good." From the various information gathered, it is thought to have been 15 per cent. advance on the crop of the preceding year. A public journal in this State, speaking of the tobacco crop, says that "the quantity of tobacco received at Louisville, for the year ending November 3, 1843, exceeds that of the preceding year 3,000 hhds; and there is every reason to believe that the receipts will continue to increase rapidly from year to year. The receipts from Green river country, in particular, are fast increasing. They will be much heavier next year."

The present crop of Kentucky is said to be a fair average, but short of the crop of 1842. This is different from the estimate above, but the information we have received justifies us in placing it at an advance, as we have done. In Ohio there has also been a small advance of perhaps 5 or 10 per cent. In the northern and central counties it is thought to have been "an average crop," "a fair crop." The kind raised is said to be principally yellow tobacco. Indiana likewise raises a larger crop of tobacco than many of the States; and there seems to have been a slight advance, though in the central part of the State it is represented to have been "almost a failure, and in the southeastern and southwestern sections it was considered "an average crop," or "as in 1842." The tobacco crop of Illinois is thought to have been somewhat larger than last year, though no very definite information has been obtained as to the crop of particular sections of the State. In the central part of the State the crop is said to have been good and well housed, and the quantity raised in the State annually increasing. It is stated in an agricultural journal in August last, "one firm in Winnebago county has just shipped to New York 36 tons." The tobacco crop of Missouri is represented to have been materially injured by the frost; yet, on the whole, is thought to have been an increased crop, as the culture is advancing in the State. The accounts from some sections are unfavorable. One public journal says that it will not be more than half a crop. Another informant writes, "many large tobacco fields have been stripped entirely clean of plants; within 48 hours, the work of destruction was completed; and more than twenty worms have been found in one tobacco hill."

In Arkansas, tobacco is also beginning to be cultivated for exportation, and there is an increase owing to the cultivation; so that the average advance amounted to 10 per cent. In Florida, according to accounts received, the tobacco crop is supposed to have been from 75 to 100 per cent. better than in 1842. The whole tobacco crop, therefore, for the past year, amounts to 185,731,554 lbs.

With reference to the cultivation of Spanish tobacco from the seed, the following remarks are made by a gentleman residing in Maryland. He says, "My experience for seven years in the cultivation and manufacture of Spanish tobacco into cigars, convinces me that the first-rate variety of Spanish tobacco—that is, the most odorous and fine—will bear reproduction in our climate twice, without much deterioration; by that time, it becomes acclimated and worthless as Spanish tobacco. For 7 years I have imported annually fresh seed from Cuba, but have occasionally made experiments with reproduced seed, and I have arrived at the conclusion above stated. I have obtained annually a cigar-maker from Baltimore, who has made for me, on my farm, and from Spanish tobacco—these produced about the average of 70,000 cigars per year; they have been sold in Baltimore and

Philadelphia for $5 the half-box—that is, $10 per thousand. The tobacco has been uniformly admired, but in former years they have been very badly made; for the last two years my crops were destroyed by the unfavorable weather. This growth and manufacture do not interfere with my regular cultivation of other crops; in fact, they are wholly unconnected with the other operations of the farmer." He mentions having obtained a premium from an agricultural society for having produced on one and a half acres, growth]and manufacture included, of Spanish tobacco, $504 net profits.

An account of the California tobacco may be found in the letter of Mr. Clark, Appendix No. 35.

COTTON.

This most important product and staple of our country is confined to a few States; and the greater part of the whole crop is furnished by four States, all of them lying between the 30th and the 35th degrees of latitude. As this crop is later gathered, and in being brought to the market, it is more difficult to arrive at an accurate estimate than it is with respect to most others. This was especially the case in the year 1842. As cotton was then in little demand, and the price low much was kept back, and not so soon brought into market. The estimate fixed on, as has been ascertained by subsequent examination, was considerably too low; and an advance is allowed on that crop as the basis for fixing the ratio of the crop of the last year. As cotton is now high, there is now a liability to consider the the crop too low, in order thus to influence the market. The fairest method of arriving at the decrease of the crop of the past year, as compared with that of 1842, as well as the causes which have led to it, is to trace its progress as far as may be, (as has already been done in the case of other crops,) through different periods. In the first place, then, as a general fact, it may be assumed that, owing to the large crop of 1842, (which has been estimated at from 2,000,000 to 2,300,000 bales,) and the quantity thus in the market, as well as the low price of the article, less, comparatively, was planted for 1843 than for the former year. The weather, too, as will be seen, was most unfavorable.

The crop of North Carolina is differently estimated at from "10 per cent" to "one third less than that of 1842. It may be estimated at about 15 per cent. less.

The crop of South Carolina, according to all accounts, must have fallen off still more. In one of the public journals in July, it is mentioned that a gentleman who had passed though several sections of the country speaks of the cotton crop as promising. Another, in the latter part of August, speaking of the cotton crop, says: "The warm wet weather for the month past has made the weeds too luxuriant, diminishing the number of bolls, and will prevent them from opening till too late in the season; whilst we hear some complaint of rust and of the cotton-worm having made their appearance." Again, in the last of September, it is said that a letter from Governor Hammond had been received, who had been absent some time in reviewing the militia, and "who, of course, saw much of the country," and he stated in it that the cotton crop of South Carolina was short fully one-third of last year. Still later, about the 1st of November, in a public journal it is remarked: "The excessive drought of the latter part of September and early part of October burst upon myriads of immatured bolls, which made a show on the stalks, and for

a time deceived many. When picked, they are light and worthless cotton. The frost of the 18th was a *killing* frost, accompanied by ice as low as 33°, preceded by ten days of weather too cold for cotton to mature at all, and by nearly a month of severe drought." One person says that his crop "is 25 per cent. shorter than he counted it in the middle of September." Information since received estimates it in the western and northwestern sections of the State at "25 per cent. less," and in the northeastern as about the same as in 1842. The average decrease must, therefore, be fixed at about 25 per cent.

Respecting the cotton crop of Georgia, which ranks next to Mississippi in this production, we have the following information: Under date of March 27, a public journal mentions "the prospects of the next crop are indisputably unpromising, and the plant at least six weeks later than that of last season. We had here, night before last, an occurrence heretofore unknown in this place. Everything in the ground (planted) is killed, and last year at this time the cotton plant was three inches above ground. At Columbus it snowed and froze all day. In the meanwhile, the rain pours down four days out of five, accompanied by lightning." In August, however, the information was: "The early prospect of the cotton crop was excellent;" and again, "cotton looks promising, but it is feared the late continued rains may cause it to rot; and we have already heard some planters complain of its shedding the forms—which will no doubt be the case generally, should the wet weather continue much longer. The cotton crop is fully one month later now than of an ordinary year; so that, with circumstances altogether favorable from this time on, we can scarcely look for an average crop." At about a month later date, in the same public journal, it is said, "All concur in the opinion that the late spring, and the continued rains of July and August, which were general throughout the cotton-growing region, have been so prejudicial that the most favorable fall ever known could not produce so large a crop as that of last year." Again, another gives the opinion, "There will be a deficit in the cotton crop of one-third the quantity produced last year, which was 2,000,000 of bales. The causes assigned are a late spring, a wet summer, devastation by worms, and an early frost." At a later date, (about the last of November,) a gentleman writing from Columbus says, "We have had no killing frost as yet; and if the quantity received here, and the assertions of planters from every part of the country, are of any weight as to the crop, then we shall have over 2,000 000 of bales." Still later we learn from the lower part of the State, "a little short of the average—three-fourths of the crop of 1842." The whole crop for the State may therefore be estimated at a decrease of about 10 per cent. from the crop of the preceding year.

The notices respecting the cotton crop of Alabama are not of so early a date as in Georgia and South Carolina; though probably the accounts from Mississippi may in part apply also to this State. Since the gathering of the crop, however, we learn from some of the agricultural and other public journals, as well as from more direct information, that the crop is probably 25 per cent. less than that of 1842. The rains in November and December proved very injurious to this crop. The accounts of the public journals, speak of the roads thus becoming impassable, and the mails impeded from the rise of the rivers, and much of the cotton left unpicked on the lowlands was thus destroyed. The decrease of the is represented to have been at least 25 per cent. below that of 1842. Mississippi

ranks first as a cotton-growing State, and the notices respecting the crop here for the past year, (which are very full,) may no doubt be considered applicable to the States which border on it. The earliest mention of it that we find in the agricultural journal of the State, is about the middle of June; which, speaking of the central section of the State, says: "The crop appears fine—a fortnight forwarder than usual." A few weeks later, however, (in July,) it is said, "The prospects of the cotton crop were never more gloomy at this season of the year, and probably the same bad effects have been produced by the same causes throughout the whole cotton region—viz. continued rains have rendered ploughing impossible, and have injured the growth of the plants. Nothing but the most favorable season, for the rest of the summer, can prevent the crop from falling short." In the latter part of August it is said, "A friend from Natchez writes that 'there has been so much rain, that his cotton crop is cut short fully one half.' Another writes from Adams county, that 'it has rained 28 out of 30 days, and part of his crop is rather more grass than cotton.'" Again, in the early part of September—"We have letters from friends in South Carolina, Alabama, and several portions of Mississippi, and all say a short crop. A friend engaged in a commission house, who has seen the best cotton region in Mississippi and Louisiana, authorizes us to say that there will not be three-fourths of what was made last year; and his information from the lower portion of this State, and the cotton States east of us, induces him to say that 1,800,000 bales will be a *full* estimate for the present crop. About the middle of the month, a gentleman who has been in Wilkinson, and several other southern counties of the State, has assured us that the crop in this section will be extremely light. The crop of the district of country 40 or 50 miles around Natchez will not make two-thirds of an average crop, and that full of *yellow locks*." A week later it is remarked: "Last year, at the same date, 2,0C0 bales were shipped from Vicksburg; this year only 300." Two persons also write that their crops will fall short of ordinary years 1,000 bales. The crop of one of them was cast this year for 1,200, the other 500 bales; whereas both together will not make over 600 bales. Again, a friend writes, "Last year I was picking from 100 to 170 bales; this year only from 68 to 100; and the cotton is stained and rotten." A correspondent of an agricultural journal, about the middle of October, writing from the southwestern part of the State, says: "The cotton is exceedingly backward in opening—much of it rotting in the bolls; heavy rains almost every day, and, on a majority of plantations, from one-third to one half of the hands are sick." A month later (early in November) the same journal gives the following information: "Were we now to estimate from our neighborhood alone, we should be compelled to bring the crop under 1,600,000 bales. There is not much over half gathered, that there was at this date last year; the picking is half past; the loss in the field from heavy rains and winds must be very great. The lost time from the cotton, in gathering corn and potatoes, will also materially affect the crop in the field; and the frost of the 14th and 15th August will have stopped making the crop. In a few cold nights and mid-days the entire crop will be open, and it is observed that there will be more chances for waste. We conclude, that if October has been unfavorable through the whole cotton region, the crop will not exceed 1,700,000 bales. If in September it promised well for 1,800,000, it now, assuredly, looks badly for 100,000 less." The increased want of care of handling is also assigned as a cause for the deficit in the number of bolls.

Speaking of the weather, a public journal says that, in November 11 inches of rain fell; which is one fourth of the annual average for a year, and the greatest in any month for many years, except in January, 1841. In a letter of the postmaster in Natchez, under date of the 6th of December, relating to the roads and mails, it is said that it had been raining there incessantly for six weeks. The same agricultural journal in Mississippi, before quoted, about the same date remarks: "The last three weeks have been such as to make the deficiency of the cotton crop still more certain. On Thursday, the 16th of November, there was a heavy beating rain of long continuance. On Thursday the 23d, another of like nature. On Saturday the 25th, a regular settled rain commenced, which continued with scarcely an hour's intermission till Friday, December 1st. In short, for more than two weeks there was not one entire day that could be devoted to picking." Similar, also, is the notice a week later: "It requires more seed cotton this year to make a bale of cotton, than we have ever known—over 1,400 bolls to make 400 pounds. We have been able to pick cotton only 13 days in November; and part of the cotton then gathered was so fully saturated with water, that we could squeeze it out in a stream. We conclude the crop must fall to 1,700,000 bales, or even below it." One person says that "it will not average much over 3 bales per hand." Another says that "against 311 bales last year, he has 175 this year." Another who "15 or 20 days ago fully expected 200 bales, now counts 160 bales, against 200 to 250 bales last year."

The amount of rain which fell in Vicksburg during the months of August, September, October, November, and December, up to the 18th of December, according to a comparative statement furnished, is as follows:

1839 - - - - - -	5.75 inches.
1840 - - - - - -	14.36
1841 - - - - - -	20.78
1842 - - - - - -	12.63
1843 - - - - - -	29.28

"In 1841 (which is the only season that had half as much in quantity) the rains fell in heavy showers, and there was a great amount of fair weather; which has not been the case this fall. In fact, during the months of October and November, there was, in 1841, but two steady days' rain. Within the last thirty days there has more rain fallen than usually falls in one-third of the year."

An informant, at about the same date, also speaks of the crop of cotton as being "one third short, inferior in quality, and not picked out in good order, on account of the heavy rains." On the whole, it would appear to be a fair estimate to fix the deficiency of the crop for the past year at 30 per cent. less than that of 1842.

Louisiana stands third in the order of the cotton-growing States; and, as we have seen, was similarly affected by the causes which decreased the crop in the States already noticed. The latter part of July, the following notice appeared in a public journal, in the interior and central part of the State: "The cotton crops of this and the adjoining parishes have, for the last three years, been seriously injured, either by rust, boll-worms, caterpillars, high water, excessive rains, or excessive droughts; and our planters, therefore, looked to this year as being the year when nothing was to interfere to prevent them from making bully crops. The cold weather in the early part of the season did trouble them some, by making them plant over

two or three times; but, after they got a stand, everything was considered safe. The high water then came and destroyed a great deal of cotton; but that was soon forgotten, as the remainder looked fine and promising. Rainy weather then set in; but, as a little rain was rather an advantage to the crops in the early part of the season, it was not dreaded until it almost drowned the crops. Still there were hopes entertained of a tolerable crop. A few days of sunny weather would, notwithstanding all this, produce a pretty fair crop, if nothing else came to prevent it. But no sooner did the sun make his appearance, than the rust and boll-worm also showed themselves; and—as if all these were not enough to insure a total destruction of the crops—last, but not least of the evils, came the caterpillars. If our planters make anything like tolerable crops, under these adverse circumstances, they will certainly be lucky."

Again: early in September, "the general impression is, that the cotton crops will be short." In a New Orleans price current of September 1, we also find the following observations: "We believe it to be generally conceded that the late spring, which prevented planting at the proper period, and subsequent heavy and long-continued rains during the growing season, have retarded the maturing of the plant some three or four weeks—a fact which may prove of essential detriment, as we believe it to be established, that, however favorable other circumstances may be, the extent and quality of the crop mainly depend upon the duration and character of the picking season. From some sections, also, complaints are made of attacks from the caterpillar, &c.; but these are only partial, though there seems to be a very general impression that, under all the circumstances which are known to have transpired, and to which we have above referred, no future union of incidents (even the most favorable) is likely to swell the production to an amount equal to the extraordinary yield of the past season. To what extent the crop will be curtailed, of course no one can calculate, with any degree of accuracy, at this early period; and, as we have always avoided indulging in any estimates, considering them not only futile, but decidedly improper in a publication like ours, we shall not depart from our established rule on this occasion. We have only to add, on this part of our topic, that, as we before remarked, the extent of the crop now entirely depends upon the duration and character of the picking season; and, as observation in past years has shown that a late spring is usually followed by an early frost, this fact will probably have its influence upon the operations and estimates of parties interested. Altogether, we are of opinion that the prospects are anything but gloomy; and, although the planter may not succeed in producing as many bales as he anticipated, yet, if proper care be taken in picking and preparing the cotton for market, it is possible that he may so improve it in *quality*, that increased prices, from this cause, will, in some degree, compensate for disappointment in the extent of production."

An agricultural journal under date of September 22d, says: "The crop in Milliken's Bend, Walnut Bayou, and St. Joseph, promised well in August; but now it will fall short one-third of last year's." This falling off is attributed to various causes: "worms injured the cotton very much; the season unfortunate and fickle; and the bolls dropping off fast, owing to heavy showers, succeeded by sunshine hotter than in August." The estimate is, that the crop of Louisiana has fallen off one-third. In the latter part of October, it is said "the crop on the Mississippi river, and adjacent bayous, will be far short of that of last year. Many causes have operated

against the river planters. Some were overflowed, and make nothing; some have low places through their fields, which, on account of the standing of rain and river water, will make next to nothing; and all have had their lands chilled by the oozing of the cold river water through the sandy texture of the banks, that the growth of the cotton has been stunted, and its maturity in opening is backward. The rains and storms were doubly injurious on the grounds of the river bottoms; the rank foliage hindering the sun's action, the rains have caused the rot to make fearful havoc, and the winds have blown out much that was opened. There will be but little *fine* cotton, either on the uplands or the bottoms. The bulk of the crop will be damaged and inferior." In December, however, in relation to another section, we find this language: "The planters have been peculiarly favored this year; the crops of cotton are abundant, if not larger than last year." Again, it is said by another informant: "The cotton was short, compared with the crop of last year; it was a bad fall for picking; from the 1st of November to the 15th of December, there were constant rains. The crop will probably not be more than 1,600,000 to 1,700,000 bales." From other information and estimates, it would appear that the average decrease of the crop of cotton in Louisiana, compared with that of 1842, was 25 per cent.

The cotton crop of Tennessee, in August, was said to "promise finely;" and in the southeastern counties it is said to have been much as in 1842; while, in the more central southern and southwestern, the report is more unfavorable. In the former, it is said that the crop was promising, until the continual fall rains and early frosts, to some extent, cut off the early hopes of the planters; in the latter, it is called but half a crop; but it is added, that, at present prices, "it is there a more profitable crop than others." The deficiency may be estimated for the average of the whole State at about 10 per cent.

In Arkansas, there was likewise a comparative decrease from the crop of 1842. By one informant, it is estimated at "only one-third of a crop;" and in south Arkansas, even not more than half a crop of the preceding year. By another, it is thought to have "fallen off from 20 to 30 per cent., owing to the coldness and backwardness of the spring, the exceedingly long drought of the summer, and the unusually heavy and constant rains of the fall. But the failure will be made up again by the increased cultivation of the product throughout the State." The average decrease of the crop for the State may probably be fixed at 25 per cent.

The cotton crop of Florida, in some parts, is thought to be 50 per cent. less than last crop, on account of the caterpillar and the seasons. The whole average decrease for the Territory is not less than 30 per cent.

The whole cotton crop for the United States is estimated at 747,660,090 pounds. It is, however, only an approximate estimate, which is at present supposed to be possible; but, from the data above given, any one can form his own conclusions. As the usual mode of reckoning of the United States crop has been to include all that was entered at New Orleans and other ports of the United States, it is not improbable that the cotton brought from Texas has been reckoned in such estimates. The New Orleans price current of September, 1843, admits this to have been the case, and mentions that, on reference to the custom-house, the imports from that source have amounted to 10,355 bales. The last year's crop in Texas is estimated at 100,000 bales. An agricultural paper in Mississippi, at the close of December, after fixing

the estimate at 1,700,000 bales, says: "We do not think any human being can tell what the crop will be; we know, all of us who have followed the cotton-making business as one does a pursuit that he expects to live by, are very liable to err; but we do hold that our opinions are worth the counting-room opinions of all the commission merchants, and closet opinions of all editors. We now speak of farmers."

The experiments respecting the introduction of American cotton into India, seem thus far to be unsuccessful; and the amount of cotton the past year imported into England from other parts of the world beside the United States, is comparatively less than in the year before. The following table will show the state of the cotton market in England at the latest dates. It is taken from Wilmer and Smith's European Times of January 4, 1844:

Sales.					Imports.		Consumption. (Taken for.)	
From the 23d to the 29th Dec. inclusive.				From 1st Jan. to 29th Dec. 1843.	From 1st Jan. to 29th Dec. 1842.	1843.	From 1st Jan. to 29th Dec. 1842.	1843.
		d.	*d.*					
110	Sea Island	$11\frac{1}{4}$ *a*	17					
60	St'd do. - -	$3\frac{1}{2}$	$4\frac{1}{4}$					
7,620	Bowed - -	$4\frac{1}{2}$	$5\frac{1}{2}$	1,494,480	957,609	1,287,937	872,250	1,079,500
21,570	Orleans - -	$4\frac{1}{4}$	7					
4,860	Mobile - -	$4\frac{1}{8}$	$5\frac{3}{8}$					
1,090	Pernambuco -	$5\frac{7}{8}$	$6\frac{1}{4}$					
350	Bahia - -	$5\frac{7}{8}$	$6\frac{1}{2}$	83,040	85,557	92,274	67,840	84,700
580	Maranham -	$4\frac{3}{8}$	$6\frac{3}{8}$					
2,300	Egypt - -	$5\frac{7}{8}$	$8\frac{1}{8}$	44,210	18,163	46,170	26,780	41,820
60	Carthagena -	$3\frac{3}{4}$	4					
—	Demerara -	—	—					
—	Barbadoes -	—	—	22,050	16,668	15,105	20,220	20,320
230	West India -	$4\frac{1}{2}$	$4\frac{3}{4}$					
4,520	Surat - -	$3\frac{1}{4}$	$4\frac{1}{4}$	134,620	169,847	110,705	134,780	95,060
—	Bengal - -	—	—					
10	Madras - -	4	—					
43,360				1,783,400	1,247,844	1,552,191	1,121,870	1,321,400

Thus it appears that from the 1st of January to 29th of December, 1843, the amount of cotton imported from the United States was 1,287,937 bales; while from 1st of January to 29th of December, 1842, the amount of the same import was only 957,609 bales; being an increase of 330,328 bales. From January 1, to December 29, 1843, the amount of cotton imported into England, from all other countries except the United States, was 264,254 bales; while from January 1 to December 29, 1842, the imports of the same description amounted to 290,235 bales; thus showing a decrease for the last year of 25,981 bales. The decrease appears to have been principally in the cotton import from India, as the falling off for the past year on these descriptions of cotton (Surat, Bengal, and Madras) amounted to 59,142 bales; so that the increase of the Brazil and Egyptian cotton was 34,734 bales. The proportion of all the other descriptions of cotton to that of the United States, is nearly one fifth. The estimated stock on the 30th of December, 1843, in England, was from the United States, 440,800

bales, being 180,600 bales more than on December 30, 1842; of the other descriptions, 213,000 bales, or 16,500 more than on the same date in 1842, and nearly one-third of the whole stock on hand, as will appear by the following table.

Estimated stocks, 30th December,	1842.	1843.
American - - - - -	260,200	440,800
Brazil - - - - -	57,100	68,000
Egyptian - - - - -	20,700	26,800
West India, &c. - - - -	18,100	9,900
East India - - - - -	100,500	108,300
Total - -	456,600	653,800

The scale of prices at the same date was the following; showing, as will appear by comparison with the price current given in the report for 1842, some singular variations of price in the different descriptions. Two tables are inserted, to give the whole more clearly; and a third extract is also added, furnishing the latest intelligence we have of the Liverpool market up to January 4, 1844.

Description.	Ordinary and middling.		Fair and good fair.		Good and prime.	
	d.	*d.*	*d.*	*d.*	*d.*	*d.*
Bengal - - - -	$3\frac{1}{4}$ *a*	$3\frac{3}{8}$	$3\frac{5}{8}$ *a*	$3\frac{3}{4}$	$3\frac{7}{8}$ *a*	4
Madras - - - -	$2\frac{7}{8}$	$3\frac{1}{4}$	$3\frac{3}{4}$	$3\frac{7}{8}$	4	$4\frac{1}{4}$
Surat - - - -	3	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{3}{4}$	4	$4\frac{1}{4}$
Sea Island - - - -						
Bowed Georgia - - -	4	$4\frac{1}{2}$	$4\frac{3}{4}$	5	$5\frac{1}{2}$	
New Orleans - - -	4	$4\frac{5}{8}$	5	$5\frac{1}{2}$	$5\frac{3}{4}$	7
Pernambuco, &c. - - -	$5\frac{1}{2}$	$5\frac{3}{4}$	$5\frac{7}{8}$	6	$6\frac{1}{2}$	
Maranham - - -	Uncertain.					
Bahia - - - -	Do.		–	–	Carthagena.	
Para, &c. - - - -	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	5	$5\frac{1}{4}$	
Demerara - - - -	5	$5\frac{3}{4}$	$6\frac{1}{4}$	$6\frac{1}{2}$	$6\frac{3}{4}$	7
Caraccas and Grenada - -	$4\frac{3}{4}$	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{3}{4}$	6	$6\frac{1}{4}$
Egyptian - - - -	$5\frac{1}{4}$	6	$6\frac{1}{4}$	$6\frac{3}{4}$	$7\frac{1}{4}$	$7\frac{1}{2}$
Smyrna - - - -	4	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	5	$5\frac{1}{4}$
Peruvian - - - -	$4\frac{3}{4}$	5	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{3}{4}$	

Current prices January 4, 1844.

	d.	d.
Upland, inferior	$4\frac{3}{4}$ a	0
Middling	$5\frac{1}{8}$	0
Fair	$5\frac{3}{8}$	0
Good fair	$5\frac{3}{4}$	0
Good and choice	$6\frac{1}{4}$	0
New Orleans (inferior Ten.)	$4\frac{3}{8}$	0
Inferior	$4\frac{5}{8}$	0
Middling	$5\frac{1}{8}$	0
Fair	$5\frac{1}{2}$	0
Good fair	6	0
Good	$6\frac{1}{2}$	0
Very choice gin marks	$7\frac{1}{2}$	0
Mobile, inferior	$4\frac{5}{8}$	0
Middling	5	0
Fair	$5\frac{3}{8}$	0
Good fair	$5\frac{3}{4}$	0
Good and prime	$6\frac{1}{2}$	0

	d.	d.
Sea island, std., and saw ginned	4 a	$9\frac{1}{2}$
Inferior	$9\frac{1}{2}$	11
Middling	11	12
Fair clean, not fine	12	13
Good clean, and rather fine	13	15
Fine and clean	15	24
Pernambuco	$5\frac{7}{8}$	$7\frac{1}{2}$
Maranham	$4\frac{7}{8}$	$6\frac{3}{4}$
Bahia	$5\frac{1}{2}$	$6\frac{3}{4}$
Egyptian	6	8
Surat	3	$4\frac{1}{2}$
Demerara (scarce)	7	9
West India (scarce)	$4\frac{3}{4}$	7
Carthagena	$3\frac{1}{2}$	$4\frac{1}{2}$

"*December* 29.

"By the arrival of two sailing packets, we have been furnished, this week, with later advices from the United States; and as the accounts generally represent the crops as likely to prove moderate only, our market has acquired a greater degree of firmness, and is now extremely firm at an advance of $\frac{1}{8}$d., and, in some instances, at $\frac{1}{4}$d. per lb. on American descriptions Speculators and the trade have both purchased to a large extent—more especially of the common and middling sorts, in the value of which the improvement is more apparent. Surats have not fully participated in the amendment, but are less freely offered than previously. Brazils exhibit little alteration. The sales of the week comprise 43,360 bales, namely: 34,220 American, 2,020 Brazil, 2,300 Egyptian, 290 West India, &c.; and 4,530 East India, &c."

"*January* 4.

"The cotton trade of the new year has opened in a most spirited manner. Sales to a very large extent have taken place daily since Friday last, and there is a further advance of fully $\frac{1}{8}$d. per lb. in the quotations. The market altogether presents a firm, healthy appearance. Speculators purchase with confidence, and the trade freely join in the demand. The transactions of this and the preceding three days amounted to 46,000 bales, of which 20,000 were taken on speculation. To-day, sales consist of 12,000 bales, viz: 1,200 Egyptian, $6\frac{1}{2}$d. to $8\frac{1}{4}$d.; 1,200 Pernambuco, 6d to $6\frac{1}{2}$d.; 500 Maranham, $5\frac{1}{2}$d. to 6d.; 2,500 Surat, $3\frac{1}{2}$d. to $4\frac{1}{4}$d.; and the remainder, chiefly American, $4\frac{3}{4}$d. to 6d."

An arrival a few days later represents considerable activity, and sales larger than usual of Surat cotton.

Although the English have failed in their experiments, yet we cannot doubt that they will still persist in their efforts to obtain their cotton from their own country. It seems, too, most probable that the attention of Great Britain will be directed to Texas, as this country affords more facilities for a rivalship with us than any other. Texas is said to contain 318,000

square miles, or 203,520,000 acres of land. The States of Mississippi, Georgia, Louisiana, Alabama, Arkansas, and South Carolina together, which raise nearly nine-tenths of the whole cotton crop of the United States, contain but 301,000 square miles, or 192,640,000 acres. The latitude of $33\frac{1}{2}°$ is said to be the best cotton land; below this, it is more exposed to insects; and further to the north, it becomes scrubby, and is exposed to frosts. This remark especially applies to Georgia, South Carolina, and Alabama. As we go westward beyond the Mississippi, a lower latitude will do better. Cotton needs dry land; wet and cold land is not good. The crop above 34° or 35° is uncertain, and below 32° its quality very much deteriorates. In the Mississippi valley, a latitude below 32° is not so good as on the seaboard. In Alabama and Florida it is somewhat better; still, the south part of Alabama is comparatively poor land. As we go towards Texas, the cotton-lands reach still lower; and, in inspecting the maps, it will be seen that it is well situated for being a great cotton-growing country. When we consider how the culture of cotton has proceeded from the east to the west, we must expect that it will still follow the same direction. It is said to be good authority, that there is probably as much good cotton-land in Texas, for the maximum qualities of cotton, as there is in the United States. The red lands of Texas, which lie on the eastern part of that country, adjoining the United States, between the Red, Sabine, and Neches rivers, are said to be good cotton lands. These two latter streams empty into the Gulf of Mexico—the former into the Mississippi. Louisiana and Mississippi are likewise said to contain much land that is too poor for cotton, though it is good grazing land. A great deal of the land in these States is a sandy soil covered with pines, but which, when once cut off, leave the lands low, and for cultivation poor. The effect of the heat on the soil is to abstract the nutritious parts or the manures furnished; and this is the cause why manures are dissipated so much sooner in warmer than in colder climates.

Besides these comparative views of the lands of Texas and the United States, in respect to the capacity for the cotton-crop, there are other considerations which deserve to be regarded on this question. The following observations are taken from an able article on the subject of cotton in the Merchants' Magazine, published at New York, January, 1844. The facts presented are of great importance: "The average increase in the growth of cotton in the United States, for the last twenty years, appears to have been about 7 per cent. per annum. But there is a limit to the extension of cultivation, and there is no longer a capacity in the United States, without a great diversion of labor from other pursuits, to increase the growth of cotton in the ratio of 7 per cent. per annum. The average crop of the United States for five years from—

1836 to 1840, was 1,625,000 bales.
1837 to 1841, was 1,680,000 bales, average increase 3.38 per cent.
1838 to 1842, was 1,732,000 bales, average increase 3.28 per cent.
1839 to 1843, was 1,848,000 bales, average increase 6.69 per cent.

Making the average increase for these eight years, 4.41 per cent.

In this period are included three very large crops, and only one very short crop; and it will, probably, be fairer to take the difference between the crops of 1843 and 1840, (the two fullest and largest crops ever made,) which difference is one hundred and ninety-six thousand bales. This shows

an annual increase in the last three years of about three per cent.; which may be assumed as the probable increase of the growth of cotton in this country for a series of years to come, provided no extraordinary occurrences interpose to disturb the settled and steady progress of events.

The two largest crops ever made in north Alabama and Tennessee were, in the year 1831, about one hundred and seventy two thousand bales; and in the year 1843, about one hundred and ninety-one thousand bales—showing an increase in twelve years of only nineteen thousand bales; and the largest intermediate crop was one hundred and forty-nine thousand bales. In the Atlantic States there has been no increase in the growth of cotton for six years. The largest crop ever made there, was the growth of 1837—about six hundred and fifty-two thousand bales. In these large portions of the cotton growing region, it is not probable, therefore, that the crops already made will, for many years to come, be much exceeded; and they may be deemed to have nearly reached their maximum. In the ten years from 1830 to 1840, the population of Alabama increased fifty-five per cent.; and the receipts of cotton at Mobile alone have already reached nearly half a million of bales. During the same period, the population of Mississippi increased two hundred and twenty per cent.; and a large portion of her most valuable lands are already under cultivation. There is no probability, therefore, that the future increase in the production of cotton in these two States will bear any proportion to the increase in the ten years last past. The largest further augmentation of the growth of cotton in the United States is, therefore, in a great measure, limited to the region of country west of the Mississippi river—to Arkansas and the western part of Louisiana. And as population increases in the high cotton-growing latitudes, where the crop is most precarious, it is probable that there will be a gradual diversion of labor from the cultivation of cotton to other objects, as has already been experienced in Virginia and North Carolina, where the crops have been reduced from one hundred and thirteen thousand bales in the year 1827, to twenty-one thousand bales in the year 1843.

In north Alabama and Tennessee the uncertainty of the cotton crop is more than one half—say as four in ten. The crop of 1831 was one hundred and seventy-two thousand bales, and the crop of 1839 was sixty nine thousand bales; and the people of that section of country will, as opportunity offers, gradually direct their attention to less doubtful products.

These conclusions seem to sustain the position assumed above, that Texas is to be regarded as probably our most formidable future rival in the culture of cotton. The prices always, in a great degree, regulate the consumption, other things being equal. The following table, taken from a New Orleans price current, will furnish the data with which to arrive at some further conclusions:

Ports.	Stocks on hand Sept. 1,		Received Since 1st Sept.,		Exported from Sept. 1, 1843, to dates.				
	1843.	1842.	1843.	1842.	To Great Britain.	To France.	To other foreign ports.	Total foreign ports.	U. States northern ports.
New Orleans, Jan. 2	4,700	4,428	321,051	451,098	83,929	30,862	10,556	125,347	58,368
Mobile, Dec. 29 -	1,128	422	135,734	126,160	9,581	9,986	383	19,950	38,381
Savannah, Dec. 22 -	3,347	2,651	76,803	120,935	20,825	4,808	-	25,633	28,038
Charleston, Dec. 22	8,284	3,975	111,774	145,997	24,065	9,559	486	34,110	47,316
Florida, Dec. 7 -	200	250	17,664	23,128	-	-	-	-	-
Virginia, Dec. 1 -	975	100	4,250	5,000	-	-	-	-	-
N. Carolina, Dec. 2	200	250	1,753	2,908	-	-	-	-	-
New York, Dec. 19	53,000	16,017	-	-	22,215	15,076	3,730	41,021	-
Other ports, Dec. 16	22,652	3,714	-	-	1,107	-	-	1,107	-
Total, bales -	94,486	31,807	669,029	875,226	161,722	70,291	15,155	247,168	172,103
Total to dates in 1842	31,807	-	875,226	-	318,107	102,457	36,067	456,631	127,620
Increase to dates this year - -	62,679	-	-	-	-	-	-	-	44,483
Decrease -	-	-	206,197	-	156,385	32,166	20,9	209,463	-

It appears, from the above table, that the amount exported from September 1, 1843, up to dates, to Great Britain, compared with that exported to the same country during the same period in 1842, fell off one hundred and fifty-six thousand three hundred and eighty-five bales; and that exported to all other foreign ports, fell off also twenty thousand nine hundred and twelve bales; while the quantity sent to the United States northern ports in the same time, in 1843, compared with that of 1842, increased forty-four thousand four hundred and eighty-three bales—showing that the consumption of cotton is gaining continually at home. There is considerable difference in the bales in different States; in Alabama they will weigh five hundred, in Georgia and Carolina three hundred and fifty, and in Louisiana and Arkansas four hundred pounds. The average weight in the United States is about four hundred pounds. The prospect now seems to be, that the price of the article will rise, though the use of it will diminish, after it reaches a certain maximum. There are, however, various new markets opened for cotton goods; and it is supposed that China will take of them to a considerable amount. The United States low cottons will drive all others from every market where they can find equal entrance. Within three months during the year 1843, it is said that many millions of yards of cotton goods were exported from Boston alone; and the amount of the value of cotton goods alone, of Massachusetts and Rhode Island, in the same time, is estimated at five millions of dollars.

The manufacture of cotton bagging is becoming an object of very great importance at the south. The amount made in some of the western States is thus estimated in a public journal:

	Yards.
350 hand-looms in Kentucky make - - - -	6,880,000
Fulton Bagging Factory, Cincinnati - - - -	800,000
Power-looms at Maysville - - - - -	700,000

Power-looms at New Albany - - - - -	$200,000
Power-looms at Louisville - - - - -	1,400,000
Power-looms at Missouri - - - - -	220,000
	10,200,000

This is said to be within three millions of yards of what is annually required for the cotton crop. A public journal in Louisiana, under date of December, thus notices the erection of a new establishment for this purpose in Mississippi:

"We are gratified to learn that the machinery for the manufacturing establishment in Jefferson county, Mississippi, has been received. It is the intention of the enterprising proprietors to supply bagging to the planters of the vicinity, manufactured from our great staple." Twenty-five cotton manufactories are mentioned as in operation in North Carolina, in which $1,050,000 are invested, and employing fifty thousand spindles, and from one thousand two hundred to one thousand five hundred persons, and which are said to consume not less than fifty thousand bales of cotton. Dr. Cloud, of Alabama, also says in reference to this subject: "Our planters are beginning to realize the advantages of extra care, pains-taking, and attention bestowed in gathering and preparing their cotton for market. The day is rapidly hastening, when our planters will correctly understand their best interests, that no cotton will be offered in market but that of the first quality. Our inferior cottons should be manufactured by ourselves into cotton-bagging, rope, &c., for sending off the better qualities. I have no doubt but it would answer much better than any fabric heretofore used, besides opening a new and large channel for consumption. Our water-power is abundantly plenty, and the intelligence of our people in every way adequate to the undertaking. It must and will certainly take place, and it will be a glorious era for the south."

The same gentleman seems to have been successful in his experiment with respect to raising much larger crops of cotton than usual. A correspondent of a southern agricultural paper says of Dr. Cloud's cotton, under date of August 8th: "The cotton is by far the finest I ever saw; bolls nearly as large as hens' eggs—and such a lot of them! I have no doubt but that the doctor will raise as much as he anticipated. I can form no idea what such stalks will turn out, but every succor branch and every limb must turn out as much as a common stalk of cotton; this stalk must now average 350 bolls, blooms, and squares. There are some with 400, some with 500 on them. One of his bolls will turn out as much as 2½ or 3 of mine." The plan is by manuring and careful tillage, as described in Dr. Cloud's letters, which have been published originally in the Cultivator, at Albany, and from thence transferred into other agricultural papers, especially those which are most circulated in the cotton-growing region. The editor of the paper from which the quotation above is taken, remarks on this subject: "This is a matter of prime importance to the whole cotton region; in fact, it seems to our mind one of the greatest we could conceive of. If, by placing a few hands at the yearly business of making manure, we can rest one-fourth of our cultivated lands—if we can feed all stock better, and then make as much cotton as we now make,—certainly we are sure of leaving to posterity a blessing of good land, improving and improved. That it can be done,

there is no question; and it only requires some individual to prove it on a scale of some extent. Five hundred bushels of manure takes time to compose, and time to haul; but if this can make an acre double its yield only, the saving is vast; giving less land to make the desired product, and more to rest; which of course will, in two rotations, either produce well with less manure, or will produce more, with the same." He mentions an experiment of his own on land which he had planted for 13 years, and which in 1833 did not average 800 lbs. to the acre; and by allowing wider space, and manuring, he found the difference to be more than 100 per cent. There can be no doubt that such is the true policy of those States which grow cotton—to keep their lands in good condition by rotation, instead of wearing them out by successive crops, as has already been done in many cases.

The effect of the productiveness of the cotton crop in the market will probably be to render the south more a customer to the west for the other products of agriculture. Still, on comparing the two crops of 1842 and of 1843—the former a large, and the other a diminished one—unless the rise of price exceed 2 cents on a pound, there is no actual increased profit on the whole aggregate for the year.

A thing of primary importance to a full good crop is a good stand. If the seed is planted at the proper time, and the weather should be fair for the next five or six weeks, or more, the plant will grow up well; but as summer advances, and the weather becomes warmer, the growth is partially checked; in the mean time, the root sends out its fibres, and gains strength till the period of its blossoming and maturing. The whole power of production thus is nearly all given to the formation of the boll; but if, at the beginning of the growth, the weather is such as to leave it less prepared for the hot season, then it suffers, and the power of production is lost for want of a good stand, as the strength of the plant must be drawn off to furnish a requisite stalk. The cold weather of the season, the past year, just after planting, in many cases injured the plant, and retarded its germination, so that when it came forth it met the hot summer sun, and thus grew up rapidly; but, not being well rooted in the ground when the rains came, the sustenance of the plant was principally drawn off to form the stalk; and though it grew forth, to all appearance, finely, yet the boll was not as fully formed, and the whole plant less prepared for the fluctuations of the weather. The season, as we have seen, was most unpropitious at the time of its growth, as well as in the gathering period. The application of cotton seed to the purpose of making oil has been heretofore mentioned in a former report. It is now said, on good authority, that boiled cotton seed fed out to cows, with a little chopped corn added, will give the butter a rich flavor and a fine yellow color, and doubles the quantity. The cotton seed, it is stated, must be well cooked, which a few minutes boiling will do. This fact may prove of great benefit to the south.

RICE.

The rice crop, in any quantity, is almost wholly confined to two States—three-fourths of the whole product, indeed, being raised by the single State of South Carolina. According to the information received, the crop of the past year was but a little below that of 1842. On this subject we have the following account from high authority: "The causes assigned for the crop not being as large as the last one, which was fairly to be expected from there having been no gale or inundation at the harvest season, are—1st. The

very extraordinary spring. The month of March was exceedingly cold, for our climate. It snowed as late as the 17th in the low country of the State, and as late as the 23d above. We had ice as late as the 23d in Charleston. In ordinary seasons we have no snow during the whole winter, and ice is not seen more than two or three times. This winter I have seen none yet. This late spring destroyed or put back the early planting, and threw the whole season for sowing into one. Thus rice ripened about the same time on the planter's hands, instead of field after field, and much was therefore lost in harvesting. 2d. The heavy rain at one period in August, then a sudden change to very dry weather, had the effect of preventing the grain from forming and filling out well; and this is assigned as the reason for the rice being of a very inferior quality, or rather for its not being strictly prime rice. The difference, however, between the crops of 1842 and 1843 will not be very great; and, indeed, there are some judges who say there will be no difference at all." It is probable that the whole rice crop must be estimated at about 5 per cent. decrease.

The aggregate crop, as appears by the table, for the past year, amounts to 89,879,145 pounds.

Besides the rice which is raised in the water, there is also the dry or mountain rice, which is raised in some parts of Europe on the sides of hills. It is said to thrive well in Cochin China, in dry light soils, not requiring more moisture than the usual rains or dews supply. By long culture, the German rice, raised by the aid of water, is stated to have acquired a remarkable degree of hardness and adaptation to the climate. The upland rice of our country is thought by some to be only a modified description of the swamp rice. It will grow on high and poor land, and produce more than Indian corn on the same land would do—even 15 bushels, when the corn is but 7 bushels. The swamp rice was originally cultivated on high land; and is not so now, because it is more productive in the swamp, in the proportion, as is said, of 20 to 60 bushels per acre; and the use of water likewise, it is stated, makes it easier of cultivation, by enabling the planter to kill the grasses. It is thought that on rich, high land, rice may be made to produce 25 or 30 bushels to an acre, in a good season. A letter from a gentleman in North Carolina gives the following account of some rice raised there. He says, "I have planted it the two past years, with a view to private consumption only; not, however, with the success of my neighbors, who are farmers, and have the things under their own management. They make from 40 to 50, and some 60 bushels to the acre, on fine land that produces ordinarily from 10 to 15 bushels of Indian corn. It is a larger grain than the gold or swamp rice, and very white; hence it is commonly called here the 'white rice.' It is planted generally about the middle of March, or first of April, in small ridges $2\frac{1}{2}$ feet apart, in chops, at intervals of about 18 inches on the top of the ridge, 10 or 12 seeds in each chop. A season that will make Indian corn, will, if long enough, make this rice; but it requires about four or five weeks more than the corn to mature. It ought to be cut before quite ripe, as it threshes off very easily, and is liable to great waste. Instead of the flail, we take the sheaf in the hand, and whip it across a bench in a close room, until the rice leaves the straw. It does not stand the pestle as well as the swamp rice, but breaks a good deal in the beating; this, however, I have heard attributed to the *dry culture*."

A new variety of rice is mentioned as having been discovered in South Carolina in 1838, called the *big grained rice.* It has been proved to be unusually productive. One gentleman, in 1840, planted not quite half an

acre with this seed, which yielded $49\frac{1}{2}$ bushels of clean winnowed rice. In 1842 he planted 400 acres, and in 1843 he sowed his whole crop with this seed. His first parcel, when milled, was 80 barrels, and netted 50 cents per cwt. over the primest rice sold on the same day. Another gentleman also planted two fields in 1839, which yielded 73 bushels per acre. The average crop before, from the same fields of 15 and 10 acres, had only been 33 bushels per acre.

In appendix No. 6 will be found a description, obtained from Mr. Rich, botanist of the exploring expedition, of the varieties of rice growing in the Philippine islands, which may possibly deserve notice from the rice planters of the south. A species of hill rice is said to grow on the edge of the Himalaya mountains, and this may, perhaps, be worth trying in our own country. Seed of this variety is already ordered by the Commissioner of Patents, who hopes to have it in season for distribution to the members of Congress before the session closes. It is a remarkable fact, that the whole rice crop of our country originated in a bag sent over from England, and a little brought from Madagascar by a Dutch vessel. The nutritious quality of rice is well known; but the effect of its use with flour, in the production of bread, may be new to some. It has been ascertained, as it is said by Arnal, that 12 lbs. of wheat flour and 2 lbs. of rice will make 24 lbs. of excellent bread, very white and good; whereas, without the addition of rice, 14 lbs. of flour will only make 18 lbs. of bread.

SILK.

During the past year the silk business in this country has been steadily advancing. A greater interest is evidently felt in the subject; and the evidence is decisive, that it needs only patient perseverance to accomplish greater things than its warmest advocates have ventured to hope for. A well represented national convention on the subject was held at New York in October last, at the time of the fair of the American Institute, by the direction of which a great number of letters and communications from persons engaged in the business in all parts of the United States have been published in a pamphlet called "*The Silk Question settled.*" The statements contained in this publication furnish the most complete view of the condition of the business of cultivation of the mulberry, raising and feeding worms, and the manufacture of silk, with the methods best adapted to success, that has before been presented to the public. Twelve States were represented by the appearance of a delegation in person, and communications were received also from the residents of eight more. From the various other information, as well as from this publication, it is evident that there has been an increase of attention to this crop all over the United States. In New England it does not probably equal that of some other sections of the country. Some scattered notices may help in estimating the crop of the first year; but much reliance will be placed on the publication just mentioned, and we shall endeavor to condense some of the important results and conclusions on account of their eminently practical bearing and utility. The greatest increase in the crop seems to have taken place at the west. The States of Ohio, Tennessee, and Indiana, have several enterprising men whose influence has been felt in urging forward this business, and the advance is most encouraging. It is very difficult to fix on any ratio, and the estimate of the table will probably, in many cases, fall far below the actual

progress; but there is sufficient to show that there is a steady increase from year to year. In the New England States, Connecticut and Massachusetts stand foremost in their attention to silk. In Connecticut, the effect of the exertions of some ardent friends of the cause, previous to the revolutionary war and just about the close of the last century, is still felt; and several establishments, especially in the town of Mansfield and vicinity, show what might have been done through the whole country had the same perseverance been manifested, in spite of early discouragements, and the same willingness to be contented with moderate profits. The experience of that little town warrants the belief that is expressed by some of its inhabitants, that "the time is not far distant when we, as a country, shall raise our own silk and manufacture it, and ultimately compete with foreign nations." From Massachusetts we learn that "the country has taken hold of it in earnest; each year, for some years, has doubled on the preceding. Last year (1842) 400 or 500 were engaged in that business in Massachusetts, and more than double that number in New England." Several establishments for its manufacture are found in this State in successful operation. In parts of Vermont there are also individuals who are devoting considerable attention to the production of silk; but, as the climate is so much colder here, and in Maine and New Hampshire, than in any other New England States, they are less favorably situated for the business. It is, however, increasing; and, among other things on this subject, it is stated that several thousand dollars worth of the eggs of the silkworm have been sent to the West Indies. There is a bounty given by the State Government; and one person expresses his opinion that "five acres of trees, of the age of four years from the seed, will produce more net profit than can be realized from 200 sheep, or a dairy of 20 cows;" and he adds, "I trust the day is not far distant when the raising of silk will be considered as profitable a business as that of raising wool."

In New York, the number of persons who are waking up to the importance of this subject is increasing. At the fair of the New York State Agricultural Society, the crop of 19 persons in a single district of the country was 2,150 lbs. In Monroe county, the quantity offered for the State bounty was said to be 2,256 lbs.; the year before, it was 1,695; in 1841, 1,539 lbs.

There are two or three fine establishments for the manufacture of silk in New Jersey, and for some time there was formerly published a paper relating to this subject in this State.

Pennsylvania formerly gave a bounty on the production of cocoons or silk; but the law, it is said, has been repealed. This has excited some unfavorable influence, and probably prevented the progress of the crop as much in this large State, as would have been the case had the encouragement been continued. The following statement shows what has been the progress of the silk culture at Economy in five years, commencing in 1838:

Years.	No. of lbs. of cocoons.
1838	1,400
1839	1,800
1840	2,400
1841	4,400
1842	5,500
In 5 years	15,500

The largest crop raised at one establishment in Europe, 200 years after the culture of silk was introduced, it is said was 3,000 lbs.

In Maryland are some ardent friends of this object; and though some have been unsuccessful in past years, in respect to the multicaulis, yet the belief is expressed that the silk business is yet destined to do well.

For the southern States this business of silk culture is admirably adapted, and yet comparatively little has been done with regard to it there. The climate is so much milder, and the means of taking care of the worms are so abundant, that there is every facility for raising large crops. On this subject we have the opinion of some residents in that part of the country. One of them writes thus: "The great difficulty in all matters of improvement in the south, is, it is too small a business—too much trouble, or too long to get the return. My own opinion is, that it is to us of the south the greatest business that has ever presented itself. An old negro, competent to feed young children or chickens, with the aid of a few small chaps from 4 to 8 years of age, can make as much as grown hands can in the field, and this without any expense of gin-house and machinery." "It seems to me a business peculiarly appropriate for the south. We can commence feeding on the 20th of April, (this year on the 16th—last year on the 24th.) We can feed without taking our field hands, or any extra building; and what is done thus is entire gain." In Georgia we are informed to this effect: "One family has made 30 yards of beautiful silk, and has made it up into ladies' dresses, and it is not inferior to the best French or English in appearance." One of the members of Congress from this State also informs us that he has a suit of silk of the manufacture in South Carolina. An experiment is mentioned as commenced in Louisiana, at Baton Rouge, by a gentleman from France, which seems to promise success. The amount of silk cocoons the past year in Tennessee is estimated by one concerned in the manufacture at from 20,000 to 25,000 lbs. In 1840 it is said there were raised in that State but 1,237 lbs. A fine manufactory here, under the superintendence of an experienced silk-weaver from London, is said to have produced splendid specimens of satin. It is also said that one hundred hands could now be employed in manufacturing the quantity of cocoons produced; and the opinion is expressed that "ultimately no other business will equal it." Governor Jones, of that State, has been presented with a full suit of domestic silk, by the silk-growers there, in acknowledgment of his efficient services to the cause of American industry.

In Kentucky we notice, in one of the journals, that 500 skeins of beautiful sewing silk have been manufactured in one family; and it is evident that the attention to it is greater than formerly.

Ohio has one of the finest establishments in the country, which manufactures 1,000 bushels of cocoons annually, with a capital of $10,000, and employing from 40 to 50 hands. The amount of cocoons produced in the Ohio valley is estimated "at least sufficient to keep 200 reels in operation."

Much attention likewise is paid to the silk business in Indiana; and the success experienced justifies the expectation that the culture of silk will hereafter become a great business there.

In Michigan, Mississippi, and Wisconsin, also, by the accounts given, the attention is more directed to this crop than heretofore.

The whole crop is estimated at 315,965 lbs. of cocoons.

The resolutions passed by the convention at New York on the subject, express the strongest confidence in the prospects of the silk culture. Ar-

rangements were made for collecting a fuller account of the state of the business the next year, by issuing a circular embracing a great variety of items; the results of which effort will, doubtless, be more cheering than any heretofore attempted. More than 150 witnesses have given their testimony, which is embodied in the pamphlet to which reference has already been made. The questions which were put and answered for the convention, related to a great variety of particular points connected with the culture and manufacture of silk. Some of the results it may be well to notice at this time.

1. *Varieties of the mulberry tree.*—The Canton, Broosa, Alpine, Italian, multicaulis, and common white mulberry, are all mentioned, and preferences are variously expressed. The Canton seems to be quite a favorite in the State of Massachusetts, and the northern climate generally. The silkworms are stated by one person to leave the other varieties for the Canton. The soil and climate are said to be "peculiarly adapted, and more congenial" to its growth "than even China, its native soil," as remarked by Dr. Parker, missionary to China. "The tree grows more in this continent than in China. It is said there to attain only about four feet in the season, while in our country it grows six to eight feet in a season, after being headed down in the spring, and growing in a dry soil enriched by the decomposition of the foliage on its surface." "I do not know," says one who has great experience, "of any compost so enriching as the foliage of the Canton mulberry." In the middle and western States the Italian and multicaulis seem to be preferred, while some judges seem to think very highly of the white mulberry. One, whose opinion is entitled to much weight, says: "I cultivate them as I do corn, and replant the multicaulis every three years." The mode of planting is of considerable importance. In a trial made by one of the most ardent friends of the cause, after laying his trees "the whole length in the furrow, manuring them with a cheap compost made principally of peat wood properly prepared," they were destroyed by the frosts of winter; but on being "*set deep, one root* in a place, in dry, sloping land, (or ridged, if flat,) rich enough to make good extended roots," the plants went safely through the winter. Thus managed, he says, "they are essentially safe from the perils of winter anywhere between Canada and the gulf of Mexico." It is not the degree of cold that does the injury in this and similar cases, but "freezing and thawing." "Trees, too, ought not to be so thick as to prevent the sun from reaching their leaves, and the air to circulate freely among them."

2. As regards the *kinds of worms*, the preference is very decidedly given to the peanut variety, and next to the sulphur. The sulphur are larger than the other. One person mentions that in a trial he made, he found that it took 4,400 peanut cocoons, or 2,200 of the sulphur, to make a bushel. The former gave 22 ounces, and the latter 14 ounces of raw silk. The peanut bushel weighed 15 lbs.—the sulphur $9\frac{1}{2}$ lbs.; and it took 300 peanuts, or 240 sulphur, to weigh a pound. The 4,400 peanut gave 22 ounces, and the 4,400 sulphur 28 ounces of raw silk. He says he generally obtains 100 lbs. of cocoons from an ounce of eggs. The number of cocoons for the pound varies from 200 up to 400: the peanut variety is said to require 300. By another, the white peanut is said to take 4,000 to make a bushel weighing 14 lbs.; of the Nankin peanut 3,600, weighing 13 lbs.; and of the mammoth sulphur 3,000, weighing 10 lbs. 9 oz. The thread of the silk worm has been found to be from 800 to 900 yards on a single cocoon.

3. The *causes of failure* in raising the silk-worm are generally attributed to the want of ventilation, as one writer remarks: "The failures in feeding, that came under my observation, in a proportion of 99 to 100, have been for the want of sufficient ventilation." Another says, "I consider the *diseases* of silk-worms to be produced by vicissitudes in the weather operating upon the moist effluvia from the worms and the litter. The remedy is the free circulation of air, and the free use of lime." Again, another observes: "I have seen all the diseases that the silk-worm is subject to; and I believe the nearer we get them to a state of nature, the greater the success." Another likewise says: "I am more convinced than ever that water does not hurt the worms. I believe if I had sprinkled my leaves with water this season, when the weather was very dry and hot, I should have saved my worms." And yet another: "I am inclined to think the cause of failure in many, perhaps in most cases, where the multicaulis is used for feeding, arises from using leaves that have not sufficient growth or thickness, and are not ripe. The young and under leaves have not sufficient nutriment, or, in other words, not *sufficient material* to produce silk. The worm fed on such leaves passes through its various and wondrous changes, lives the time prescribed by nature for its existence, then either stretches itself out and dies, or winds a thin indifferent cocoon, because it has not silk *enough to wind a better.*" "I consider unslaked lime a powerful disinfector of disease among silk-worms; and very (I would say absolutely) necessary to be used in warm weather." In another case, when the worms were dying by thousands, of the yellows, they were put out; and, says the informant, "I let it *rain on them two days and two nights;* let them dry, covered them with lime, and they commenced eating." The use of lime in another case is mentioned with success in staying the disease. The remark is made in another communication: "Some of my worms this season were wet by the rain leaking through the roof, but I could not see that they were injured by it. Care was taken, however, to dry their food in rainy weather as much as possible." Another recommends that, if attacked by the yellows, they should be placed in the open air.

4. As respects the *mode of feeding*, there are several points very clearly established: that the practice of feeding in the open air, or *open feeding*, (as it is termed,) *early* feeding, in contrast to *late* feeding, and, in most climates, the *one crop system*, are important particulars to be regarded. The following remark is made in a communication from Vermont: "And now I have come to the conclusion that these three things are indispensably necessary for the successful culture of silk: 1. *Plenty of feed*—it matters not so much what kind, whether white or multicaulis; 2. *Plenty of fresh air;* and last, though not least, *cleanliness and plenty of room.* And with them there is no more difficulty in raising silk, than there is in raising sheep or pigs." Another from the same State says: "The worms were fed in *an open building*—so much open, that the wind would frequently blow the leaves from the shelves where the worms were feeding." The testimony on this subject is almost universal. One says: "I have found, on close observation, that nothing imparts such vigor to the worms as a good dry breeze of air. A most excellent authority, with reference to this subject, speaking of his own experience, says: "The result of the whole is, in my judgment, *the more air the better;* only guarding against sudden gusts of wind, that will disturb your leaves or bushes. As to ordinary turns of cold weather in our summer months, their effect is to render the worms torpid.

Of course, they will not, in this state, eat and grow; and there is loss of time in getting them through; but this is the only loss to be apprehended. Upon returning warmth, they revive and go on with their wondrous labors, apparently uninjured by their temporary interruption." It is also said: "We think there is a decided advantage in using finely-chopped leaves the first two or three weeks—the whole leaves appear to smother the worms." A correspondent from Mississippi remarks: "This season I fed worms with leaves well wetted with dew—so much so, that, shaking them on the floor would pretty well sprinkle it, which we generally did. Heretofore, we gathered dry leaves in time, or even wiped them dry; but it was so tedious, we resolved merely to shake the water off, and our worms grew apparently more rapid than they ever had before. As a fact to prove this, they began to wind the 25th or 26th day." An experienced hand mentions that, particularly at the time of moulting, it is very necessary to avoid disturbing them by noises or sudden starts—such as throwing their food on them, or loud talking and laughing, &c.—as it injures them. A similar universal testimony is given in favor of *early feeding*. The *one-crop system* is likewise very generally approved, though a number of crops are successfully raised in the warmer climates. By the use of Gill's feeding and ventilating cradle, and the tent system, it is said the expense is lessened one-half, while the amount produced is double. As to the *kind of wood* to be used for the winding, one person remarks that, after a variety of experiments, he found the bass-wood the best of the whole; "the leaves are large, and do not curl much; and, by setting them up close, the worms will crawl in between the leaves, and deposite their cocoons frequently four or five on a leaf, so that it is very easy gathering them. The floss comes off very clean; and, there being plenty of room, there are very few double ones." Another recommends paper, folded in a fan-like shape, suspended over the worms—the wide-spread part within their reach. Small bundles of straw of about the size of the wrist, crumpled and bent so as to stand out, spread out *downwards*, tied within the feeding frames, near the lower end, are said to be excellent for the purpose.

5. In regard to *the method of preparing the silk* for the manufacturer, the following considerations are deemed of importance: A silk-dyer says: "Most people clean the silk with soft soap—destroying the native gloss in freeing it of its gum, owing to the vegetable alkali the soap contains. Many dyers use nothing but the best of white soap. About 25 pounds of good white soap dissolved in sufficient clean soft water, is used for 100 pounds of silk; put the silk loosely in thin bags, boil gently 2½ hours, cool and wash it well in a running stream, and beat occasionally to free it from all impurity." The Piedmont reel seems to be considered the best of any of the reels in use, and great consequence is attached to a uniformity of reeling. One who had great experience on these subjects remarks: "While on the subject of reeling, perhaps I shall be excusable for mentioning what, to me, proves a source of deep regret. I mean the inexperience of those in different sections of our country, who reel their own silk without knowing the necessity of its being done in a particular manner to suit the manufacturer. Lots of silk are often offered for sale, which, to look at, appear perfectly good; but, on examination, are not saleable at any price, because they cannot be worked." Another, also, alluding to the same thing, says: "Raw silk must be reeled only in large quantities, of a uniform quality and fineness, in order to be employed in manufactures." "The proper business

of families, and the only business adapted to them in the silk culture, is the feeding of worms and the production of the cocoons." Again: a gentleman well versed in the business of silk, asserts that "two reelers shall each take one bushel of the same parcel of cocoons, and one shall produce from her portion a pound of silk worth $6; while the other shall produce the the same quantity worth only $3—the latter being not even the value of the cocoons before she began to reel them." The establishment of filatures in great central points, which shall furnish a near market to those who grow the cocoons, is most desirable. Already there are a number in successful operation.

6. The *manufacture* of silk has been carried to great perfection. It is said: "A large establishment in Baltimore manufactures immense quantities of silk and worsted vestings, employing some 15 or 20 Jacquard looms, and working up large quantities of domestic silk; and yet they dare not let it be known that their goods are manufactured in this country." But there are other manufactories in various parts of the country which furnish sewing silk, fringe tassels, gimp, satin, velvet, and other silks. The uniform testimony of those employed in these establishments, (some of whom have followed the business for 20 or 25 years in England,) is, that they never saw finer, or as fine silk, as the American when carefully prepared. It is said to give a stronger thread than foreign silk, and, by many manufacturers, is altogether preferred. The experiment of making paper from mulberry leaves, which is said to have been successful in France, is to be fully tried in this country the present year. It is said that a discovery has been made that pongee silk is produced from the fibrous bark of the mulberry, and that it has never passed through the silkworm. It is also said, on the same authority, that "there is nearly 100 per cent. difference in the use of foliage in raising cocoons. That, to produce 1cwt. of cocoons, from 20 to 22 cwt. of foliage of grafted trees, propagated by grafting buds, cuttings, or layers, is necessary; while from 12 to 13 cwt. of leaves from seedlings will accomplish the same result."

The *profit and feasibleness* of the raising and manufacture of silk are also fully established. One person, who produced raw silk, says that his net profit was equal to $60 per acre. At a large establishment in Massachusetts, the profits are estimated at 37½ per cent. To show the kind of manufacture, and the amount of capital invested, and nature of expenses, we insert the following account with reference to a fine manufactory in Ohio: "My factory is in full and successful operation, producing more goods than at any time previous. Our operations, as per factory books, and account stock taken August 8th, for the past 16 months, is as follows, in a condensed form, viz:

Cash value of factory buildings - - - - -	$1,340
Do. do. machinery, engine, and permanent fixtures -	4,060
1,067 bushels cocoons purchased - - - - -	3,600
280 pounds reeled silk purchased - - - - -	1,400
Contingent expenses, &c. - - - - - -	604
Wages paid factory hands, &c. - - - - - -	3,152
Dyeing, dyes, &c. - - - - - - -	607
Wages paid weavers - - - - - -	1,610
8,000 bushels of coal, at 5 cents - - - - -	400
	$16,773

In buildings - - - - - - -	$1,340
In machinery, &c. - - - - - - -	4,060
Manufactured 3,731 yards of velvets, vestings, dress, and other silks, &c. - - - - - - - -	6,324
1,006 cravats and handkerchiefs - - - - -	1,396
850 pairs of gloves and stockings - - - - -	875
70 pairs of shirts and drawers - - - - - -	325
10 pounds of sewings - - - - - - -	100
Contingent credits - - - - - - -	1,000
Cocoons, reeled and other prepared silk, warps in looms and other stock, coal, &c., per invoice - - - - - -	3,180
	$18,600

7. As to *the adaptation of our country for the object*, the evidence is equally clear. An able advocate of the enterprise remarks that "the climate of our country approximates closely to that of China in the same parallels of latitude; our geographical position is similar to that country; the boundaries of our land and sea are like theirs; and our prevailing winds in summer are like their land winds. The dry warm atmosphere of both countries in seasons is well adapted to the growth of silks; in fact, (to say a great deal in a few words,) this and China are the only legitimate silk-growing countries. In Europe artificial means can only give to the eggs the forwardness which the atmosphere here gives. Throughout Europe the question is, 'How shall the eggs be hatched?' Here it is, 'How shall they be kept back until we are ready for them?' England may compete with us in the manufacture of silk, but she can never grow a pound." "All that is needed is the enterprise and industry of the people of the country, to bring silk into the list of American staples." Another says: "I fully believe that this precious and invaluable product may be cultivated anywhere and everywhere in our extended country and continent wherever our favorite Indian corn can be grown." Another also: "I cannot doubt that the business is destined shortly to become a great and important branch of national industry, and a vast and inexhaustible source of national wealth." Another, still, remarks: "Our experience is, that the silk culture is much the most profitable of any branch of husbandry in this section of country; and we feel confident that it will, ere long, spread through the Union, and become second to none except the cotton-growing interest, even if it does not take the lead of that also." "It may be associated with the farming business of the country; and females and children can attend to it, so that it may be carried on without interfering with either domestic or agricultural concerns; while they will give at little expense a very considerable added profit." In France, ladies have done much in this enterprise. It is to be hoped that the whole country will soon be led to awake to the importance of the subject; and that, instead of silk being found among our list of imports, it will, ere long, occupy a place among the staples exported to our foreign markets, and producing additional wealth to our extended country.

SUGAR.

The same difficulty attends the formation of the estimate respecting the sugar crop in Louisiana, as has been mentioned with regard to the cotton crop. The lateness of the crop renders it difficult, at the latest period of the preparation of this report, to get advices in season for correcting the

table. The amount which was given in 1842 to this crop was probably too small; so that an advance has been made on that estimate, in considering it as the basis of a comparative estimate for the past year.

The following are some of the notices gathered from the journals in Louisiana:

In August, the cane crop is said to be unusually backward—"a month later than usual." In September, another editor says: "Having lately traversed a considerable portion of the sugar district, through Assumption, Ascension, Terre Bonne, Lafourche Interior, Jefferson, and the river parishes, we can say, of a truth, the cane crops are indifferent. The backward, unfavorable, and extraordinary spring has so injured the crops, that even a late open fall cannot now benefit them to an amount equivalent to the damage." Another journal also says: "All accounts concur in representing the cane as being exceedingly backward—a position which is the result of a variety of adverse causes, such as the late spring and severe frosts in March, the unfavorable character of the weather during a great portion of the time since, and the interruption to cultivation from the prevalence of the influenza among the hands at a period when it was of great importance that the full force should be in the field. From the present state of the crop, therefore, it is quite evident that in no event can it attain to the unusual yield of the past season. And the present condition of the crop renders it extremely probable that a portion at least will be exposed to the deleterious action of frost, which, if at all severe, has the effect not only to reduce the product, but to impair the quality. Some extension of cultivation may partly compensate for the falling off of the yield; but it can hardly be adequate to meet the reduction which existing circumstances indicate." Again, in the first week of December it is said: "There is the worst indication possible of a bad crop being made—(the cane's going to seed)—it being a law of vegetation, that as soon as the seed stalk is thrown up, the juice leaves the plant. I much doubt that we shall this season see even that," [half a crop.] Again: "From all accounts, the crop of this year must fall greatly short of that of last year." "It is now generally conceded that the present crop will not much exceed eighty thousand hogsheads." "There can now be no doubt that the crop will be very short." "Accounts from the coast and Lafourche represent a great falling off of the crop." At a later date the following remarks are made in relation to the crop in Attakapas: "Nearly all our sugar planters have done rolling. A few have not yet finished—the latter part of the season having been so favorable that the cane, instead of being injured by the frost, as is generally the case at this time of year, has completely matured. At present, the yield is extraordinary. As we have before observed, the crop in this parish will be *good*, in every sense of the word."

Various experiments are said to have been made in the manufacture of sugar—among which are Mr. Penny's pan and Mr. Rilleux's process, which it is thought will produce a great influence on this principal staple of Louisiana. Mr. R. "guaranties to increase the product of sugar twenty-five per cent. instead of an equal amount of molasses, and to save the whole expense of fuel for evaporating sirup and grinding the cane, except what the *baggasse* (refuse cane) will furnish." The apparatus he uses, it is said, will turn out twelve thousand pounds of sugar in twenty-four hours. The entire saving in fuel, and increase in value of the products to the State of Louisiana, it is stated, will be about $10,000,000, provided the plan is as successful as promised. For an account of this process see appendix No. 37.

Others estimate the falling off of the whole crop of the State at thirty-five to forty per cent. from the preceding year.

The *maple sugar* crop proved a great failure the past year; and the falling off in different parts of the country reaches from twenty, twenty-five or thirty, to fifty and seventy-five per cent. The great cause seems to have been the unfavorable weather. In some towns in the northern States much sugar is made. In Fryeburg, Maine, it is said that thirty-five years ago there were thirty tons annually made; and the business had been carried on ever since. One farmer made more than half a ton in three weeks.

In New Hampshire, by one person the loss on the crop is estimated at "ninety per cent." In another section it is said "it was almost an entire failure." "The long-continued cold weather in the sugar months, (March and April,) and the abrupt approach of a warm summer," is assigned as the cause. "Not more than one-tenth of the usual quantity was made." Another, still, estimates the falling off at "fifty per cent.," which is probably about the proper average for the whole State. The same is the estimate for the other New England States. As great a reduction must be made for the crop in New York. The notices run: "Very little made," "quantity small," "unfavorable season." In Pennsylvania, the great depth of snow at the proper season, (being five feet on a level,) which prevented the farmers going into the woods as usual, is represented as the cause of a falling off amounting almost to an entire failure—probably seventy-five per cent. from the crop of 1842. In Kentucky, the sugar crop is estimated to have advanced about twenty or twenty-five per cent.; in Ohio, to have fallen off as much as thirty per cent. Some of the notices say that, "for want of freezing days and thawing nights," there was "not half as much as in 1842." In other sections, the decrease is thought to have been "ten per cent." and "fifty per cent." "The transition from winter to spring was sudden and complete, as there were but few successive freezings and thawings." The same was the case in Indiana, though in some sections the yield is said to be "good;" yet in others it was "an entire failure," "forty per cent. less," "poor yield," "a bad season, not more than a quarter made." In Illinois the decrease was, perhaps, twenty per cent. less than the crop of 1842. In Michigan, fifty per cent. less, or more. By some, the falling off is set as high as from fifty to seventy-five or eighty per cent. less; the winter continued until summer; and "the snow was so deep, the ground did not freeze."

The whole sugar crop of the United States for the past year is estimated at 66,400,310 pounds.

An important process of manufacturing maple sugar, which produces a most beautiful article, is described in a communication by the gentleman who gained the first premium at the State fair at Rochester, to the committee on maple sugar of the New York State Agricultural Society, which is given in full in appendix No. 7. Specimens of the sugar may be seen at the Patent Office.

CORNSTALK SUGAR.

This subject has excited much interest the past year in various parts of the country, and numerous experiments have been tried; and although the point of easy granulation does not seem to have been reached, yet the result of the different trials tends to show that the great facts respecting it, before announced, are confirmed. Good molasses and sirup have been

obtained, and a variety of accounts will be found in the appendix Nos. 8 and 9. We shall briefly allude to some of these. Mr. Beal, of New Harmony, after giving an account of his crop and mill, and mode of manufacture, says: "From information which I have obtained from those acquainted with the boiling of cane juice, the sirup begins to grain immediately after being taken from the kettles. I endeavored to heat mine in the same way, as near as circumstances would permit, but the graining did not commence in less than from 12 to 48 hours: perhaps something depends on the quantity." He also says, "20 moderately well-grown stalks yielded a gallon of juice; one gallon of juice will probably yield from a tenth to an eighth of sirup; one pint of sirup weighs one pound and a half, and will yield, by measure, perhaps one-fourth molasses and three-fourths sugar."

Mr. Plummer, also of Indiana, though he failed in his efforts to make sugar, on account of not being able to bring it to granulation, yet made an excellent quality of molasses—as he says, "as pure and beautiful a straw color as any tree (maple) molasses we ever made; the juice," he adds, "was abundant, and rich, it being boiled down to molasses in a short time."

Mr. Frenis, of Pattonsburg, in Virginia, writes that he made "some excellent sirup," and "very good molasses." Mr. William H. Deaderick, of Tennessee, made several trials, but met with the same difficulty in granulating it as others; but a good sirup was procured, "somewhat darker than honey, but perfectly transparent, and free from impurity, and pronounced superior, without exception, by numerous persons who partook of it, to either imported molasses or honey. It presented no other taste than that of a rich and luscious sweet, wholly free from any strong or unpleasant flavor, such as appertains to the articles just named. The sugar obtained did not, either in appearance or taste, differ from New Orleans sugar more than different lots of this article do from each other." He says, "100 large cornstalks will afford 10 or 11 gallons of juice, which, when boiled down to the point of crystalization, will yield one gallon of sirup. One acre of ground drilled with corn one foot apart, in rows three feet asunder, will give about 14,000 stalks. Of course, these (at 100 stalks per gallon) would yield 140 gallons of sirup suitable for any of the purposes for which brown sugar is used. If intended for molasses, it need not be boiled down so thick, and will probably make 160 or 170 gallons. Of sugar it requires 3 drachms ($\frac{3}{8}$ of an ounce) by weight to sweeten an ordinary sized cup of coffee. Of the sirup it requires also 3 drachms, by measure, to do the same. Now, as there are just as many drachms in a pint as there are in a pound, it follows that a pint of the sirup is equal to one pound of sugar, or one gallon to eight pounds. Of course, then, 140 gallons of sirup, the produce of an acre of land, is equivalent to 1,120 lbs. of sugar."

Mr. H. J. Chalmers, of Monroe county, in Georgia, is also said, in a public journal, to have made excellent sirup. The editor says: "We have tested its quality, and can pronounce its saccharine flavor to be milder and richer than any of the Louisiana sirup we ever tasted; it has nothing of the acidity often detected in other sirups, and particularly in molasses, but leaves upon the palate a pleasant and agreeable sensation, that insensibly makes you smack your lips." Mr. C. affirmed that he could easily have produced sugar, but he had no shallow kettles for the purpose. He intends to try it next season; and patriotically exclaims, "I trust the day is not far distant when the planters of Georgia will become independent of the West Indies and Louisiana for their sugar and sirup." Mr. H. J. Thompson also is said to have had similar success; and the article produced is pro-

nounced "equal, if not superior, to the best sugar house molasses. It is equally as transparent, and in flavor resembles very much the Florida sirup, which is esteemed superior to any other for table use." Mr. Thompson says that the test which he has given the matter, in the manufacture of the 25 or 30 gallons, has not only satisfied him that the best of molasses can be made from cornstalks, but that he can obtain a better return for his labor from its cultivation than from any other crop.

Mr. James S. Pope, also, of Edgefield district, S. C., and Colonel J. B. Walker, of Georgia, are said to have tried the experiment, but the particulars are not given.

Mr. S. Baldwin, of Franklin county, Ohio, expresses the opinion, that "if the juice be allowed to stand for a time in a large open vessel after it comes from the mill, the heavier parts of the feculencies will fall to the bottom, and the lighter will float on the surface, and, when the liquor is drawn off, it will be nearly or quite free from impurities." "Towards the latter part of my operations," he says, "I adopted the course above mentioned with my sirup; what I boiled into sirup one day, I let stand to settle till the next, before being made into sugar."

The New York State Agricultural Society offered a premium last year of $100 for the best experiment in the manufacture of sugar from the cornstalk cultivated for the purpose, and the juice extracted by iron rollers, so as to obtain the maximum quantity of sugar, with a full account of the process and expense. The report of this committee, with the letter from Mr. Adams, of Ogden, respecting an experiment of manufacturing sugar from the cornstalks, will be found in appendix Nos. 11 and 12. He says that his sanguine expectations "have, in every respect, been realized, except in the graining." His intention is to pursue the subject still further.

Rev. Mr. Humphrey, of Edwardsburg, Michigan, whose letter will be found in appendix No. 13, mentions that the time of granulation was reduced to less than one week, by his adding twice the quantity of cold water after it had attained to thick molasses, and boiling it again to a proper consistency, and putting it into a shallow vessel. The letter of Messrs. Hubbard and Boudick, from the same State, likewise contained in appendix, contains some other particulars as to graining, &c.

An important experiment was tried in Louisiana, to determine the comparative production of the cornstalk and cane, as to sugar, which the gentleman who tried it considered unfavorable to cornstalk, even allowing its juice to granulate as well as that of the cane. The letter of Messrs. Tillotson, with Mr. Webb's, of Wilmington, containing remarks on the same, will be found in appendix Nos. 14 and 15. From that experiment we may, however, augur the most successful triumph of this article, especially as respects the west and north. The cornstalk juice may not be as sweet at the south, as at the west and north, since the variety of corn cultivated is different, and the business of manufacturing cornstalk sugar there may not be of equal profit with that of cane; but it must be remembered that the price of sugar at the west is from 8 to 10 cents per pound, and of molasses at least from 50 to 75 cents per gallon; so that the calculations of Messrs. Tillotson on the cornstalk will not answer for the article at the west. Besides, they have made no account of the leaves and tops, which produce fine fodder—sufficient, as has been proved, to pay the expense of cultivation. Taking, then, their calculations respecting the cane to be correct, and only allowing what is the general testimony as regards the amount of production—1,000 lbs. instead of 2,000 lbs. per acre—we shall have the following result:

For cornstalk sugar on four acres, viz:

1,300 lbs. of sugar, (a small amount, as may be seen by the calculations of others,) at 9 cents per lb. - - -	$117 00
82 gallons of molasses, at 50 cents per gallon - - -	41 00
	158 00
Expenses, as estimated by Mr. Tillotson, deducted - -	59 50
	4)98 50
Profit on an acre - - - - - -	$24 62½

But the labor charged (see the appendix as before) could be performed by the husbandman himself, without cash paid out; and Mr. Humphrey, in his letter, states that he sold his molasses at 75 cents per gallon, which is the price paid for very much of the cane molasses used at the west. Taking cane product at 1,000 lbs. of sugar per acre, and 45 gallons of molasses, (which is considered a fair average in the report on sugar cane, published some few years since by order of Congress,) and the result of the cane crop of four acres will stand thus:

4,000 lbs of sugar at 5 cents per lb. - - - -	$200 00
180 gallons of molasses, at 20 cents per gallon - -	36 00
	236 00
Expenses estimated - - - - - -	100 00
	4)136 00
Profit of an acre - - - - - -	34 00
Profit on an acre of corn, as above - - -	24 62
	$9 38

Giving only $9 38 in favor of cane, without reckoning the leaves and tops of the cornstalk for fodder, which, if they pay the expense of cultivation, would leave the balance in favor of the cornstalk—to say nothing of not more than 325 lbs. of sugar being allowed to the acre of corn, when, by all experiments at the west and north, from 500 to 1,000 lbs. per acre must be allowed. If we allow 500 lbs. per acre for four acres, with their other data, we should have—

2,000 lbs. of sugar, at 9 cents per lb. - - - -	$180 00
128 gallons of molasses, (probably more,) at 50 cents per gallon	64 00
	244 00
Expenses (made too large at the west) - -	59 50
	4)184 50
Profit of an acre - - - - - -	46 12
Profit of an acre of cane - - - - -	34 00
Balance in favor of cornstalk - - - -	$12 12

The results of Messrs. Tillotson's experiments show several facts most conclusively:

1. That the saccharine matter exists in great quantities in the stalk.
2. That the saccharine quality of the cane and the cornstalk is about the same.
3. That in hot climates, where the sugar cane flourishes well, (and, perhaps, cornstalk on the whole is not so sweet,) the cane is the most profitable; yet even there the profit with the cane would not be greater, if as great, for the agriculturist in the interior, where good sugar would cost 9 cents, and molasses 50 cents, if only the average crop which has been allowed to the sugar planter in this country (of 1,000 lbs. per acre) is admitted. Messrs. Tillotson (who kindly tried the experiment at the request of the Commissioner of Patents) remark that the cane of this year's growth yielded only 1,000 lbs. per acre. The danger of the cane crop from frosts may also deserve consideration.

It is hoped, and confidently believed, that the difficulty respecting the granulation will before long be removed, and a fair experiment will then show that the importance of this subject has not been overrated. That this expectation is not unreasonable, may be seen from the fact that 18,000 weight of sugar, per day, is now made directly from common molasses of the common kind. It is said that, in making cornstalk sugar, long stirring destroys granulation, and renders it gummy; and that it should be boiled quick, so as not to be long on the fire. Experience will soon remedy many defects, which always belong to an incipient stage of an enterprise.

Mr. Webb and some others think it preferable to plant corn so thick that the stalk will not grow so large, nor produce many ears. Should this prove correct, it is not improbable that corn sown broadcast, at the rate of two or three bushels per acre, will dispense with all after culture—especially if sown on land not overrun with weeds. Indeed, the very growth of corn sown broadcast, if previously soaked in saltpetre water to give it a rapid start, will overtop the weeds and choke them. It may also be further remarked, that there may be one third difference in the saccharine matter of the different kinds of cornstalk. Experiments are to be made on this subject; but, as a general fact, it may be said that that stalk which produces the most ears will contain the most sugar. Some corn possesses much oil; others none at all.

M. Biot, in a report before the French Academy of Sciences, says: "Sugar of maize is precisely that of sugar-cane mixed with a small quantity of sugar of fecula." He thinks the removal of the ear from the stalk injurious, as, by comparison, that which had been thus prepared gave only 12 per cent.; while that which had not been so, gave 13 per cent. He thinks, also, that the fecula is probably owing to the manipulation, and not properly existing in the plant.

WINE.

This product has become less important, in consequence of the increasing disuse of wine in our country. There are some facts, however, which show that our country is well adapted to the culture of the vine, and that our native grapes may produce as good wine as that of foreign kinds. We shall throw together some of these, without reference to the order of the States. Near Mississippi city, in Mississippi, grapes are said to succeed well.

One person is mentioned who had, on an average, from vines four years old, over two hundred fine bunches to the vine. Some others have had over five hundred bunches to the vine. Mr. Mottier, of Delhi, near Cincinnati, has six acres wholly devoted to grape-vines. The vineyard was planted in 1829, and began to yield fair returns in two or three years; and, during the whole period, he has lost but a single crop. He finds there a northern preferable to a southern exposure. The Swiss vine-dressers, it is said, say that, in Switzerland and Germany, if they save the crops of three years out of five, they think they do well. "About 1,500 gallons of wine were made last year, (1842,) for which he finds a ready sale at one dollar per gallon. The Catawba affords a white wine in good repute with connoisseurs, resembling Rhenish. The Cape grape makes a red wine more like Burgundy. His vines, this year, (1843,) are in a very promising state; and should nothing untoward occur, he thinks they will yield him from 200 to 400 gallons of wine to the acre." There are also said to be some half dozen other vineyards in the vicinity; and the amount of American wine manufactured there, and the preparations for extending the business by Germans from the valley of the Rhine, are stated to be larger than would be imagined. "The Scuppernong grape of North Carolina has been pronounced by a French gentleman, not very ready to admit the excellence of American grapes, to be equal, if not superior, to any he had ever seen in France." It is said that, "in southern climates, under the best management, 2,000 gallons an acre may be calculated on as a vineyard product. Some of the vines of ten or twelve years' growth yielded half a barrel apiece." A gentleman in North Carolina, who this last year made 30 barrels, intends the next year to make 40 or more. The culture of the grape has also been successful in Louisiana, and the following calculations have been said to have been the result of experience: "One acre planted with 1,000 vines will produce a crop of fruit weighing 50,000 lbs., which will yield, after pressing and allowing for all waste, 16,666½ lbs. of pure juice, or 2,083 gallons of wine." Some clusters of the kind, called the grape of Canaan, are said to weigh 5 to 6 lbs. a bunch. The grape has also been cultivated very successfully as a fruit for the table, in the vicinity of New York. One gentleman at Croton Point is said to have twenty acres of the Catawba and Isabella grapes. The country abounds with many fine native grapes, some of which have already been adapted for cultivation. A southern journal speaks of the discovery, within the past year, of a white cluster or bunch grape, indigenous to the United States, in a remote unsettled part of Leake county, in Mississippi, on the Yokanodkano river. The bunches are very large; the fruit transparent, thin skinned, and oval; pulp soft, with three seeds inclosed; it is a great bearer, of delicious flavor, and was long known to the Indians. It is called the Yokanodkano grape.

As a good mode of preserving grapes, it is recommended that they be put "in tight boxes or kegs in alternate layers with carded bats of cotton."

The whole amount of the wine crop in the tabular estimate for the United States, is 139,240 gallons.

COMPARISON OF PRODUCTS OF OTHER COUNTRIES.

It may be interesting to compare the agricultural products of our own country with those of some of the countries of Europe. In McGregor's Statistics there is a table, compiled from one prepared by Baron Von Malchus,

Minister of Finance in Wirtemburg, in 1828. According to this table, the number of bushels raised to each soul was, of grain—wheat, barley, oats, and rye:

In Great Britain - - - - - -	12 bushels.
In Denmark - - - - - -	20 do
In Prussia - - - - - - -	12 do
In Austria - - - - - - -	14 do
In France - - - - - - -	7 do
In Spain - - - - - - -	5 do
In the United States - - - - -	$18\frac{1}{2}$ do

But there has been a great advance since then, both in Europe and in this country; for instance, in France, which in 1841 produced of all the grains, including Indian corn, 547,550,443 bushels; and the United States, the same year, produced 533,988,970 bushels. The population of France was more than 31,000,000, and of the United States over 17,000,000. Thus the proportion of grain in the United States to a person, compared with France, was nearly two to one. Similar comparisons with other countries would be greatly in favor of our own country, showing that our surplus is the greatest.

GENERAL REMARKS.

In thus closing the account of the crops contained in the tabular estimate, we cannot help adverting to the fact, that a great variety of agricultural productions are not mentioned. The root crops form a very important item as fodder, and are cultivated with increasing success in many parts of the country. The turnip has not yet become as great a favorite among our farmers as it is in England, where very large crops are produced; nor are carrots, the product of which has sometimes in England reached to over 37 tons per acre; or parsnips, which are said to be excellent food for horses and cattle. The cows of Jersey and Guernsey, fed with parsnips and hay, yield butter during winter of as fine a tinge, and nearly as good a flavor, as if they were fed in pastures. Parsnips also stand the winter better than any other root vegetable. Swine, too, are fond of them. Besides the ruta baga, mangel wurtzel, sugar beet, and other varieties of the beet, occupy a useful place on the farm, and are more or less cultivated in this country.

In appendix No. 36 will also be found an interesting account of an experiment respecting the raising of pumpkins on grass land, and the great amount produced from one vine, which furnishes some important facts with reference to the culture of that product, showing that it might be rendered very profitable.

The productions of the orchard—apples, peaches, and pears, and other varieties of fruit—are most successfully raised for market in some of the States. The peach orchards of New Jersey and Pennsylvania form a source of large profit to their enterprising proprietors. The apple crop suffered severely the past year in some of the New England States.

The keeping of sheep, and the production of wool, might be appropriately noticed. Many farmers in Wisconsin Territory are said to be beginning to give their attention to the production of wool; large flocks have been introduced into the southern counties.

Much is doing to ascertain the best breeds of cattle for our country, and many noble specimens have been exhibited the past year at the agricultural

fairs in various parts of the Union, showing the increasing attention which is given to this subject.

The products of the dairy too, and the apiary, with the new methods of raising poultry, might claim a notice. The subject of the best modes of cultivation, manures, and the proportions of the various parts of husbandry to one another, belong to the general subject. On some of these topics we propose to add a few remarks. A number of articles may be adverted to as deserving some attention, on account of the favor with which they come to us from authorities of good name.

OTHER AGRICULTURAL PRODUCTS.

These may be divided into new objects of culture or attention, and those which are already, to some extent, established with us.

Among the *new* objects of attention is the *symphytum officinale*, or PRICKLY COMFREY. If all that has been published respecting it be true, it would seem to deserve attention as likely to prove a valuable acquisition to our farmers. It is said, by a good authority, to have been first noticed in Loudon's Gardeners' Magazine, in 1830, by Dr. Grant, of Lewisham, England, where it was tried by a number of cultivators. The account says: "Cattle of every kind are said to be fond of it; and Mr. Grant thinks an acre might be made to produce 30 tons of green fodder in one year. The plant is of easy propagation by seeds and roots; it is also of great durability, and, if once established, would probably continue to produce crops for many years; and in that point of view it would seem to be a valuable plant for the cottager who keeps a cow." Mr. Ezekiel Rich, of Troy, New Hampshire, in a communication to the Keene Sentinel, also has recommended this article as food for cattle. On experiment, he found both the root and the top palatable and nutritious. He stated the product of the top to be very great—two cuttings in June and September; thus giving more than six tons per acre of good fodder, if well made. The root, it is stated, should be harvested but once in two years, and will yield 2,400 bushels per acre. The account published by Mr. Rich led a Mr. Robinson, in the vicinity of Portsmouth, N. H., to make an experiment; and a notice of this trial appeared in the Portsmouth Journal, in substance the following: He collected a few roots, and made a bed of half a rod square. The plat was set in rows of about 15 inches distance. It is said that an acre like it would have produced three or four tons of tops, when dried. The weight of hay on this plat, when cut and dried, was found to be 22½ pounds; it was cut in September, having suffered from a dry season, and scarcely started till July. It is thought that another season it would produce at the rate of 8 tons to the acre. The vegetable stood erect 2½ feet high, full of leaves and of bloom. As an article of diet, Mr. Rich says: "It will probably prove one of the best and cheapest articles of healthful diet now known, not outdone by the potato or Indian corn."

The roots are dried, ground, and boiled as porridge, and are said to be beneficial for colds, and diseases of the lungs and bowels. Mr. Rich recommends one third of the comfrey meal, with wheat flour, or Indian meal, for porridge-pudding or griddle cakes, &c. It is said that comfrey is called a native of Siberia, but may be regarded as indigenous to this country. The plants may be found in almost every neighborhood.

Another article which would afford much nutritious food for cows and

other animals, is the JERUSALEM ARTICHOKE, which is cultivated in Europe, and where it is highly prized. It sometimes produces, of the roots, more than 2,000 bushels per acre, besides that the leaves are used when green; and the stalks also, cut up with other fodder, are much relished by cattle, and for milch cows. The plant is a hardy one and easily raised, and deserves more attention than has been bestowed upon it in our country.

The CORN SPURRY also is highly recommended for trial by our farmers. It grows in England "in sandy fields, 8 or 10 inches high, with narrow pointed leaves and small white flowers." The plant has been very useful in poor sandy lands in Denmark, Flanders, and Germany, where it is used for pasture as well as for hay; and sheep very greedily feed on it. The seeds are rich and highly nutritious for all kinds of stock, and are said also to afford a valuable oil. Loudon says that in Germany and the Netherlands it is sown in corn stubble, and in the intervals between some crops is fed to sheep. It may be sown and reaped in 8 weeks, either in autumn or spring. It is said to be excellent for cows; and to enrich their milk so as to make fine butter. Thaer says, that in proportion to its bulk, as hay, or cut green, or in pasture, it is the most nourishing of all forage, and gives the best flavored milk and butter. Its small and scanty produce forms the only objection to it. Schwertz, an able German writer, speaks of it, and recommends it for poor sandy soils as a very valuable means of pasture, in which way it is most profitably used.

In the British Farmers' Magazine for 1841, an account is found of a plant called the BOKHARA CLOVER, which seems to deserve further inquiry. It is a variety of the *melilotus arborea;* and the account given by Mr. Taylor, who presented it to the Royal Agricultural Society of England, is, that it vegetated freely, and, though planted in the spring, grew most luxuriantly up to the latter part of September, when it was 4 feet high; and the stalks were manufactured into strong and durable hemp. "Horses eat the plant with great avidity in its young state; and, to judge from its extraordinary growth the first year, it may be fed off three times, viz: the middle of June, July, and August. It stood the winter of 1839 –'40 well, proving itself to be a hardy plant. On the 28th of April, 1840, a small portion of it was cut, which was then 15 inches high; and on the 28th of May again, height 16 inches; on the 28th of June, height 17 inches; in August, 15 inches; and in September, 12 inches. The first flowers appeared in June, and by the middle of July it was covered with its highly fragrant white blossom. A large portion of it had been left for seed; and towards the end of September the crop was harvested, each plant producing from 10,000 to 20,000 seeds, the stalk being from 12 to 13 feet in height. From the experiments I have made with Bokhara clover, I should calculate that an acre would produce from 20 to 30 tons of green herbage. The first year it may be cut in June, July, and August; each cutting averaging from three to five tons of green herbage. The second year in April, May, June, July, August, and September; each month producing from 3 to 5 tons of herbage. If intended to be saved for seed, it must not be cut more than three times—in April, May, and June. The roots form a sort of manure, and furnish from two to three tons of hemp. Great advantage must be derived from its cultivation, as it forms a valuable green food for all sorts of cattle at an early period of the season; and if cut when 15 or 20 inches high, an abundant crop would be produced, yielding hay superior in quality and quantity to the common herbage plants." It is also recommended as a good preparation for a wheat

crop; a plant capable of being cultivated with success and advantage on almost all heavy and dry descriptions of land, if in a tolerable state of fertility, and may be sown from March to June. It requires to be sown on rich soils, free from weeds, 8 to 10 lbs. of seed to the acre; on stiff and less fertile soils, 14 to 15 lbs. per acre. The appearance is said to be elegant, and the blossom most fragrant. It is recommended to be mixed with hay that has been damaged by wet weather, on account of the fragrance of its leaf imparting to the whole the smell of new hay."

Another individual says: "I know of no plant whatever that will produce so much weight of vegetable matter in equal time and space; and were it only for the production of vegetable manure, it is a boon to the agricultural world." It is said to have been raised in this country, near Philadelphia, and the gentleman who tried it says: "There is no grass or plant I have yet seen that affords me such promise as the sweet-scented or Bokhara clover." Others seem to consider it as undeserving of notice. Probably no thorough experiment has yet been made of it in this country.

Lucerne and sainfoin have already been mentioned as deserving more notice and more thought in portions of our country which are best adapted to its culture.

Millet, likewise, and vetches, have neither of them been tested as they should be in the United States. In Europe they rank high among the articles of fodder for cattle, and might prove profitable to our farmers.

Mention is likewise made of a gigantic cabbage in France, called the Anjou cabbage, which is said to be an excellent vegetable both for the kitchen and food for cattle. The description given of it is, that it will grow in almost any soil, not excepting even the most indifferent, if manured sufficiently. It is commonly sown in June, in good mould, and watered from time to time in case of drought. The plants, where they stand too thick, must be thinned, and kept free from weeds by hoeing. "About the first of November (probably September or October would be better in this climate) they should be transplanted; they should be planted then in trenches, dug with a spade that is buried almost up to the leaves; the distance between them, two or two and a half feet each way." They should never be planted with a dibble. A layer of manure should be spread along the bottom of the trench, and the roots of the cabbages covered with it; the mould taken out should then be replaced on the manure; and as the trench will not hold it all, there will be a ridge between each row of cabbages. Towards the middle of May the ground to be well stirred between the plants with a spade. After this, nothing more is necessary than to pull up the weeds as they appear. In June the large ones, which still continue green, begin to be fit for use, and soon arrive at their perfection, which they retain till the next spring, then soon run up to blossom. Their seeds ripen towards the end of July, and should then be gathered. In Anjou they grow up to the height of 7 or 8 feet—sometimes they reach to 8½ or 9 feet, and have even been seen of greater height. From June, when they begin to be ripe, (when they are fit for use,) their leaves are gathered from time to time, and then they shoot out again; they are said to be large, and excellent food, and so tender that they are dressed with a moment's boiling. Cattle eat them greedily, and they likewise greatly increase the milk of cows.

Madder, which was mentioned in the report for 1842, is said to repay a net profit of $200 to the acre when properly managed. It produced on the farm of a gentleman, who has devoted some attention to this product in

Ohio, at the rate of 2,000 lbs. per acre, and he believes it may be made to produce 3,000 lbs., which is a greater crop than the average crops of Germany and Holland. It is probable that it may hereafter be more an object with our farmers, but the introduction of its culture among them must be gradual. Nine acres have been planted by one person in 1839, which he harvested in 1842. The labor required is said to be from 80 to 100 days work per acre, and a crop is not reaped till it is three years old. The nature of the soil in which it is cultivated is said to have considerable influence on the color of the dye produced from madder.

Olives, it is asserted, may be grown in some of the southern States. A gentleman in Mississippi is stated, in an agricultural journal, to have "the olive growing, which, at five years from the cutting, bore fruit and was as large at that age as they usually are in Europe at eight years old." "The olive here," it is added, "will yield a fair crop for oil at four years from the nursery, and in eight years a full crop, or as much as in Europe at from fifteen to twenty years of age." The lands and climate there are stated to be as well adapted to the successful cultivation of the olive for oil, pickles, &c., as any part of Europe. Some hundreds of the trees are said also to have been growing in South Carolina, and the owner expressed his conviction that this product would succeed well on our sea-coast of Carolina and Georgia. The frosts, though severe, did not destroy or injure them; and in one case, when the plant was supposed to be dead, and corn was planted in its stead, its roots sent out shoots. It is well known to be a tree of great longevity—even reaching to 1,000 or 2,000 years; so that when once established, it will produce crops for a great while afterwards. The expense of extracting the oil is also stated to be but trifling.

Indigo.—This was once a most important crop in South Carolina, and some attention has been given to it by an individual or two in Louisiana, and the enterprise is said to promise success; and enough might undoubtedly be raised in this country to supply our own market, so that we should not be dependent on other nations for this article. Some indigo produced at Baton Rouge is pronounced to have been equal to the best Caraccas, which sells at $2 per pound; and the gentleman who cultivated it remarks, that one acre of ground there, well cultivated, will yield from forty to sixty pounds; that it requires only from July to October for cultivating it; that there is not connected with it one third of the expense of time that is generally required for the cultivation of cotton. He therefore intends in future to turn his attention to the cultivation of indigo, in preference to cotton.

Notice has been taken by some of the agricultural journals of the introduction of the China tea for cultivation in this country. It proves, however, on examination by a careful botanist, to be only a substitute for the China tea. In a letter from the gentleman who raised it, he says that "it grows well in our climate, and reached the height of three or four feet, and branched and put forth leaves and seed in abundance. As it vegetates and comes forth about the time of cotton," he adds, "I think that a southern climate will suit it best. I cultivated only about forty plants the last year, and that has given me seed enough to raise any quantity that may be called for, and tea enough for the use of my family." He says that "it makes a very good tea; but I find it necessary to scald it previous to curing, which takes off a green taste and smell which attend it when not scalded, and in its pure state." The specimen accompanying a letter received, was submitted to Mr. Rich, the botanist, who is engaged in arranging the plants

collected in the exploring expedition, and who has pronounced it to be "a species of *sida*—a genus of plants belonging to the *malvaceæ* or mallow tribe, a family abounding in mucilaginous plants, and held in much repute as emollients, &c. The whole family is said to be destitute of unwholesome qualities; the bark of many is very tenacious, and used as a substitute for hemp.

He also gives an account of the tea districts of China, and of some attempts at its cultivation elsewhere. His communications in full will be found in appendix No. 16.

This is an instance where the knowledge of botany would have saved some from the error of supposing a different plant to be the real China tea. The article may, perhaps, deserve further attention, as one which may be cultivated without difficulty, and which may also prove a good substitute for tea. The Chinese are said to be very fond of SAGE, and wonder Europeans come to China to buy tea when they have sage at home. It was formerly exported from Holland to China in considerable quantities, and the Chinese, it is asserted, would readily give two or three chests of green tea for one of sage. It is not improbable that it might prove an article of large profit to this country; and the experiment, as appears from the papers, has recently been made with success. The culture of this crop might, therefore, be extended, so that it might become an important article of our exports to China. At present, it is mostly confined to gardens.

The SUNFLOWER, and CASTOR-OIL, and BENE plants, with RAPE and POPPY, have all been mentioned as useful for the production of oil, and they are cultivated in Europe for this purpose. The sunflower, as appears from a comparative view from Veit, a German author, stands foremost in the production of oil, and gives 40 pounds of oil to 100 pounds of seed; next is the poppy, which gives 37 pounds; then rape seed, 36 pounds; radish seed, 31 pounds; mustard, 30 pounds; gold of pleasure, 28 pounds; flax, 26 pounds; hemp, 20 pounds.

The time of the burning of equal quantities of some of these oils was:

The oil of poppy, 14 hours.
The oil of sunflower, 13 hours.
The oil of rape, 11 hours.
The oil of mustard, 11½ hours.
The oil of flaxseed, 10 hours.
The oil of gold of pleasure, 9½ hours.
The oil of olives, 9½ hours.
The oil of hempseed, 8 hours.
The oil of tallow, 10½ hours.

The advantages of the sunflower are said to be, that the seed is good for oil, which it produces a gallon to a bushel; the refuse is good for cattle; the leaf may be manufactured into cigars, which are said to have powerful pectoral properties; the stalks, when burnt, afford a superior alkali; the comb of the seed, or filaments, an excellent food for hogs.

MUSTARD may be an article deserving further attention, as it is cultivated to a much greater extent abroad, and large quantities of the seed and flour are imported annually from foreign countries. It is said to yield 20 bushels to an acre, and to sell in the eastern cities at about $3 per bushel. In Albany, $3 50 is paid for the black; the white is somewhat less.

The cultivation, by planting, of the LOCUST TREE, is an object of impor-

tance, and probably will prove profitable to many who engage in it. The CATALPA tree is stated, on the authority of the late President Harrison, to be more durable than the locust or mulberry tree, and is of more rapid growth.

CRANBERRIES were mentioned as abundant at the west in the report for 1842. The high cranberry is cultivated to considerable extent, profitably, in parts of New England; and to show that the suggestion formerly made respecting them was practicable, it is mentioned in an agricultural journal in Boston, under date of November last, that 550 barrels of cranberries had arrived there by the western railroad from Michigan, which were sold at from $6 to $6 50 per barrel. Two thousand barrels were sent in one year from Michigan.

APPLES have been sent to England and commanded, it is said, a good sale there. Peaches, also, preserved in ice, have been exported to foreign climes. One or two hundred boxes of strawberries preserved in ice were sent by one person to the West Indies; and, when opened, they were found to be as fresh and fair as when they were first packed. In appendix No. 34 will be found an interesting account of the culture of the apple, which seems to promise great success.

The vast quantities of EGGS which are consumed abroad may yet render them, as heretofore suggested, an article deserving of attention. The number consumed annually in France is said to exceed 7,250,000,000, of which Paris uses about 120,000,000. A mode of preserving them was mentioned in a former report. The following others may also be useful. Reamur, after a variety of experiments, found that the best (that is, the cheapest and most effectual) mode was to apply grease or oil, into which they are rubbed or dipped. Another method highly recommended in England is, to take one bushel of quick lime, thirty-two ounces of salt, and eight ounces of the cream of tartar; mix the salt with as much water as will reduce the composition to a consistency that an egg, when put into it, will swim. Eggs are said to have been thus kept for two years. The number of eggs imported into Great Britain in 1839 is stated to have been 83,745,723. The practice of *hatching eggs by artificial heat* has recently been introduced into this country, and is said to succeed well. Considerable attention has been paid to securing the best species of poultry in some parts of the country.

As an article which promises to do well in Mississippi, may be mentioned TURPENTINE; large quantities of which have heretofore been furnished by North Carolina. An experiment has been made in the former State with reference to the business of preparing it, which is stated to have been successful and encouraging to a larger prosecution of the enterprise.

The PALMETTO ROOT is stated to be valuable for the purposes of tanning, as containing a large proportion of the tannin principle; and as this production abounds in the south, it may be an object of some importance in that section of our country.

By a new process of steam, the tannin principle is now extracted from bark, and, thus reduced to a small compass, may be easily exported. The consumption of oak bark in Great Britain is said to be 40,000 tons, more than one half of which is imported from the Netherlands.

In appendix No. 17 will be found the letter of Mr. Scott on the acclimation of seeds, which gives many interesting particulars. It is stated that

seeds may be brought to this country from foreign climes in dry wood ashes, perfectly preserved for germination.

The productions of the DAIRY are of great value, and may become still more so as their exportation is extended. Science has been directed to the analysis of milk, and principles having an important bearing on the success of this pursuit have been developed. Thus Dr. Playfair says, respecting a series of experiments, that the milk of the evening contained 3.7 per cent. of butter, and of the following morning 5.6 per cent. The deficiency in the first observation is referred to a greater consumption of butter, or its constituents, from respiratory oxidation during the day, when the animal was in the field, than during the night, when it was at rest in the stall. When confined during the day, and fed with after grass in a shed, the proportion of butter rose to 5.1 per cent. When fed with hay, the butter was 3.9 and 4.6 per cent.; when fed with portions of potatoes, hay, and bran flour, the butter was 6.7 and 4.9 per cent.; when with hay and potatoes, 4.6 and 4.9 per cent.

From the account of the experiments of Professor Trail, contained in the Transactions of the Highland Agricultural Society, are derived the following results:

"1. That the addition of some cold water facilitates the process, or the separation of butter, especially when the cream is thick and the weather hot.

"2. That cream alone is more easily churned than a mixture of cream and milk.

"3. That butter produced from sweet cream has the finest flavor when fresh, and appears to keep longest without acquiring rancidity; but the buttermilk so obtained is poor, and small in quantity.

"4. That the scalding of the cream, according to the Devonshire method, yields the largest quantity of butter, which, if intended for immediate use, is agreeable to the palate and readily saleable; but if intended to be salted, is most liable to acquire, by keeping, a rancid flavor. The process of scalding is troublesome, and the milk after the removal of the cream is poor, and often would be unsaleable, from the taste it has acquired from the heating.

"5. That churning the milk and cream together, after they have become slightly acid, seems to be the most economical process, on the whole, because it yields a large quantity of excellent butter, and the buttermilk of good quality.

"6. That the keeping of butter in a sound state appears to depend on its being obtained as free from uncombined albumen or casein and water as it can be, by means of washing and *working* the butter when taken from the churn."

That our country possesses some fine milch cows, cannot be doubted by any one who will take the pains to run over the agricultural journals of the past year. A few specimens of these may be added: In Massachusetts, we notice the mention of one cow which fed on pasturage, and having also two or three quarts of meal per day, on being milked three times in the day yielded milk sufficient for 18 lbs. of butter in a week; also, another which gave 16 lbs. of butter in a week, besides supplying a family of four persons with milk; another also is mentioned, which gave 253 lbs. 8 oz., yielding 12 lbs. 6 oz. of butter. A cow in Wheeling, Virginia, is likewise mentioned as having yielded for 16 days, in May and June, on being milked three times

per day, $34\frac{1}{2}$ quarts of milk for two weeks; the butter made amounted to $14\frac{1}{2}$ lbs. per week. Another, still, is mentioned in the State of New York, which, in 21 days, gave $65\frac{1}{2}$ lbs. of butter, or at the rate of 1 lb. for 5 quarts of milk. The average of 65 remarkable cows, mentioned by Mr. Colman in his report, is 10 quarts for 1 lb. of butter; and several cows which have been formerly noticed as distinguished for the richness of their milk, in one case, gave milk which only yielded 1 lb. of butter for 18 quarts; and in another, 1 lb. for 10 quarts.

In the appendix No. 18 will be found a new method of obtaining cream from milk, by a process said to be well known in Devonshire, England, in which vessels formed of zinc plates are used; and the effect in the production of butter is stated to be 40 oz. to 4 gallons of milk—being an increase of cream $12\frac{1}{2}$ per cent., and of butter upwards of 11 per cent.

Much is said to depend on the proper beating or working of butter, by which it may be deprived of its buttermilk; rubbing with the ladle is not sufficient. In an English publication of high authority, it is said that "the great point in making good butter, and that which will keep, is the freeing it from buttermilk; and, if everything else is well done, if this point is overlooked, good butter is impossible for any length of time. The mixture of milk in any degree with the butter is sure to produce frowyness, or some unpleasant taste to the butter; and the entire freedom from this, constitutes the grand secret of making good butter. There are many who think washing butter with water incompatible with retaining the rich flavor; but if the water is cold and pure, it is scarcely possible anything should be washed away, the buttermilk (which destroys the flavor of all butter) excepted. Besides, the best butter in the world, and that which in all markets commands the best price, (viz: Dutch butter,) is invariably made in this way; and where the example has been followed by others, it has rarely failed of success. Perfectly free from the substance that causes it to assume the putrid frowy taste of bad butter, it may be kept with almost as much ease as tallow; solidity in packing, clean sweet vessels, and a low temperature, will ensure its keeping for any reasonable time. Let no one expect good butter, however, so long as coarse impure salt is used, or a particle of the buttermilk is remaining in it."

The allusion above made to the Dutch butter, may be appropriately followed with some account of the mode of butter-making in Holland, which is found in one of the ablest of our agricultural journals. It is said that, in 1830, England imported no less than 116,233 cwt. of Dutch butter, and 167,917 cwt. of Dutch cheese. In 1835, 106,776 cwt. of butter came from Holland. It is a singular fact, that the English consume more cheese than butter: thus, the consumption of cheese, in London alone, is stated to be 38,000,000 lbs., while that of butter is but 19,000,000 lbs. In France, the opposite proportion prevails. The pastures of Holland, it is said, "lie low and flat; and as the water in the canals is always near the top, the soil must be moist." The ground, instead of being ploughed up, "is kept in good condition by top dressings, consisting chiefly of the solid, and especially liquid manures collected in the cow-houses, mixed with the scrapings of the small canals." The first year after such dressing, the land is generally mown for hay. The Hollanders, likewise, "are careful in the selection of their cows; they are generally fattened and turned off to the butcher at eight years old, and the bulls at four or five. The cows are turned to pasture in March or April, and are at first covered with a very thick cloth of

tow covering the upper half of the body, from the shoulders to the tail, to prevent disease from the cold. They are pastured about thirty weeks. Hay is their common food in winter, though rape cake and brewers' grains are sometimes added. The *byers*, or cow-houses, are generally lofty, airy, paved with large square bricks, and kept perfectly clean. The roof is about 10 feet high. There are no racks or mangers, but the food is placed in gutters, always clean, near their heads. Gutters in the rear serve to carry off the urine and dung, and these gutters are also kept clean. The cows are always milked by men, and the butter and cheese made by women. Ninety cows are managed by nine men and two women. Two women are considered enough for any dairy."

Three kinds of butter are made: *grass* butter, when the cows are at grass; *whey* butter, from the whey of sweet milk cheese; and *hay* butter, made in winter. The method of making grass butter is thus described: "The cows being thoroughly milked, the pitchers of milk are put into coolers. When the cream has gathered and soured, if there is enough, they churn every 24 hours, and the churn being half filled with sour cream. A little hot or boiling water is added in winter, to give the whole the requisite heat; and, in very warm weather, the milk is first cooled in the coolers. In small dairies, the milk is sometimes churned, when soured, without separating the cream. The butter, immediately after being taken out of the churn, is put into a shallow tub, and carefully washed with pure cold water. It is then worked with a slight sprinkling of fine salt, whether for immediate use or the barrel. When the cows have been three weeks at grass, the butter is delicious, and is made in fanciful shapes of lambs stuck with flowers of the polyanthus, and sells as high as 70 or 80 cents the 17¼ ounces, or Dutch pound. If intended for barreling, the butter is worked up twice or thrice a day with soft fine salt for three days in a flat tub; there being about 2 pounds of this salt allowed for 14 pounds of butter. The butter is then hard packed by thin layers into casks, which casks are previously seasoned and cleaned. They are always of oak, well smoothed inside. Before being used, they are allowed to stand three or four days filled with some whey, and thereafter carefully washed out and dried. Each cow, after being some time at grass, yields about one Dutch pound of butter per day." Two points in this process are most important: "1st. No salt is used but what is incorporated with and dissolved in the butter, which is necessary to give it flavor; and, 2d. The butter intended for keeping is worked from six to ten times, to incorporate the salt, and to separate from it every particle of liquid, which, if left in it, would induce rancidity."

The *hay* butter undergoes a like process.

The *whey* butter is made by allowing the whey to stand three days or a week "after being separated from the curd, when the cream is skimmed off, or the whey itself put into the churn, and the butter is formed in about an hour. By this process, in winter one pound of butter is obtained from each cow in a week; or, in summer, one pound and a half." The relative prices are said to be for grass butter 17 cents, for hay butter 13 cents, and for whey butter 12 cents per pound.

The Goshen butter, in the State of New York, is celebrated all over the country, and the following account is given of one of the most celebrated of dairies there. The cows are "regularly salted and kept in good pasture during the summer; in the winter, each cow is kept in a stall, with a separate door to it, in a building two sides of a square round a large yard; the upper story

of the building is appropriated for fodder and hay. The cows are brought up to the yard, night and morning, and regularly milked. The outer paling of the yard is 50 feet from the house: here, opposite the farm house, is placed a tunnel, into which the milk is poured as fast as a pailful is obtained from the cows. A short perpendicular tin pipe connects the tunnel with a horizontal one which is buried 2 feet under ground, out of the way of the frost, and leads into the cellar of the house. When the milking is going on, a woman stands in the cellar with supply-pans placed under the end of this horizontal tube, which, as fast as filled, she sets away on the cellar bottom. Here the milk stands till loppered and soured, as it is said to make more butter in this state than any other, and of a better quality. In this state it is poured, cream and all, into churns which hold a barrel each. If the weather be cool, and the milk not sufficiently warm to come readily, a can is filled with hot water, and this is placed in the milk in the churn, and stirred about till it reaches a temperature of 55 to 60 degrees." Water-power is preferred for churning to any other, as it is more regular. "When the butter has come, the power is stopped, and a pump rigged into the churn; the handle of which is attached to the power, and the buttermilk pumped into a reservoir just outside of the cellar, standing on a level with the ground. From this the buttermilk is conducted by a tin pipe of about 100 feet to another reservoir close by the piggery, from which it is dipped out in buckets, and fed to the pigs. After being churned, the butter is thoroughly washed off with cold water; if this be not done, it is difficult to get the buttermilk clean out of it. As soon as cool and solid, the butter is taken on a marble or smooth stone table, properly salted with clean fine salt, and worked over thoroughly with a wooden ladle or spatula—the hand never being allowed to touch the butter, as, from its heat, it softens it." After being thoroughly worked, the butter is packed in firkins of seasoned white oak. The firkin, previous to packing, is well washed with cold water, and then rubbed all round with salt, to prevent the butter from adhering to its sides. It is put down in layers as churned, 3 or 4 inches deep.

When the firkin is filled, a linen cloth is placed over the top of the butter; on this, half an inch of salt; to which is added a little water, to form a brine. The cellar is considered very important; it should be seven feet deep—eighteen inches of which, at the top, should be allowed for ventilation; the windows to be covered with very fine wire gauze, to let in the air and keep out the insects; the walls to be of stone and pointed, the floor of slabs.

The best temperature at which butter may be procured from cream, as appears by the experiments of Dr. Barclay and Mr. Allen, is in commencing churning from fifty to fifty-five degrees, and at no time ought it to exceed sixty-five degrees; while, if it falls below fifty degrees, it will be more difficult and laborious to obtain the butter. It was found by Mr. Ballantyne that the greatest quantity of butter is obtained at sixty, and the best quality at fifty-five degrees in the churn, just before it came. A mode of working butter is said to be practised in some parts of France, which makes it exceedingly compact and hard. A trough is prepared of requisite width. Into this is placed a wheel, which comes within the sixteenth of an inch of the bottom, and turning on a crank. The space in the trough is filled. At one end, which is left open, the butter and brine are pressed in; the other end being nearly closed, the wheel made to revolve, and the butter comes

out at the other, thoroughly salted, and free from buttermilk, in plates of the sixteenth of an inch in thickness. Great importance is attached to the kind of salt used in preparing butter for the market. Some of the kinds of salt have an injurious influence on the butter, to prevent its keeping.

It has been discovered that most kinds of wood contain considerable quantities of pyroligneous acid, which decomposes salt in butter kept in such tubs. The linden, or bass wood, is the only one which, as appears by careful experiment, is free from it; others, it is stated, may be freed from it, and thus rendered suitable, by boiling three or four hours, well pressed under water. Much importance has always been attached to the preparing of butter, so that it will keep on board of ships at sea and in warm climates. A simple process is now practised, which is said to be effectual for this purpose; which is, to have good butter well churned, and worked and packed hard and tight in kegs of seasoned white oak; the head is then put in, leaving a small hole into which brine is poured to fill up the vacant space; and of so much importance is it deemed, to prevent any bad taste, that the plugs for the hole must not be made of cedar or pine, but of cypress or bass wood, as otherwise it would be injured. After which, these kegs are placed in a hogshead well filled with brine of full solution, that will bear an egg, which is then headed up tight and close. The importance of this subject may be estimated from the fact that, as it appears, the standing contracts for butter, in our navy, that will keep at sea, are at twenty-six cents per pound, and for cheese twenty cents per pound. It is now put up of good dairies in Orange county, and keeps perfectly. An account of a mode of preparing butter for shipping, by a merchant in one of the cities of New England, corroborating the above, may be found in appendix No. 19.

In the making of the best butter, rich pastures are considered very desirable. A sufficient diversity of grasses mixed together, is useful; but there are some weeds which do great injury to the milk. The species of ranunculus known by the name of the *buttercup* is said to have effected great injury to the butter in parts of England. An epidemic has also prevailed among cattle in England, which has been traced to the same cause. It is said to be now spreading through this country. The plant is described as being of an acrid poisonous nature, and, by various experiments, it has been proved to be very fatal to animals; cattle will generally avoid it, but they sometimes do not. Those which are confined to limited pastures, are more exposed to it; while those which have a wider range, and can make their choice of plants, suffer less. Greater care should be taken to eradicate it from the fields; and by the use of lime among the materials of compost, and frequent turning over the seeds, which are sometimes thus carried forth into the fields with the manure, it should be destroyed. Ploughing up also of the land may be necessary; but, at all events, the buttercup, if possible, should be rooted out. Other weeds, too, of a similar nature, and likely to injure the milk of cows, should be taken away from the pastures on which they feed. The expense of effecting this object will be more than repaid by the benefit derived from the purer milk and more excellent butter which will be obtained.

The bone-dust manure used on certain pastures in England, in which the soil is not adapted to this kind of manure, is said to have caused the cheese to deteriorate.

Mr. G. Davis, of New York, to whose enterprise in visiting the cheese-making districts of Holland much is due, and who supplies the United States navy with cheese which will keep on shipboard, and in warm climates, by

which thousands of dollars are saved to the country, describes the cheese thus made under the inspection of a first-rate cheese-maker from Holland, as globular, weighing about four pounds each. The curd is worked by hand until it is perfectly soft, like a paste; then it is put into other moulds, and salted—that is, a small quantity is put upon the end of the cheese, and changed for every fifteen days; then it goes through a process of salting in warm salt whey for forty-eight hours, and is then taken out and wiped dry with a cloth; then put into other moulds for six weeks to dry and cure; after it becomes quite dry and hard, it is put on shelves to cure, so that it may be cased up. The loss in drying out is very great, as the Government receives them half yearly in each year. The expense of making is said to be much greater than of the common kind of cheese, and the loss in drying it four times as much; but the certainty of their keeping has been fairly tested, and they are stated to keep equal to the best Holland cheese. Of the flat kind formerly used in the navy, more than one-half, it is said, proved to be unfit for use, and was thrown overboard.

The Dutch are said to be remarkably particular as to the quantity and quality of the salt they employ; and this, it is thought, is the principal cause of the sweet and delicious flavor of their butter, which, though well flavored, hardly tastes of the salt, or at all acrid. The average quantity of milk from the Holstein cows in Europe is about two thousand five hundred quarts per annum; and it is calculated that every hundred pounds of milk will give three and a quarter pounds of butter and six pounds of fresh cheese, fourteen pounds of buttermilk and seventy-six and three quarter pounds of whey, where cheese is made. Fifteen quarts of milk is, then, considered a fair average for a pound of butter, though sometimes the milk is so rich that twelve quarts make a pound. On the whole, it is thought that one hundred pounds of butter, and one hundred and fifty pounds of cheese per annum, to each cow, is a fair product.

A great yield of butter and cheese is mentioned in a late agricultural journal as having been obtained in Oneida county. From twenty cows (commencing 15th of April, and ending the 1st of December) were made ten thousand pounds of cheese and one thousand pounds of butter—being an average of five hundred pounds of cheese and fifty pounds of butter from each cow. They were fed on whey from the dairy and two quarts of oatmeal per day.

LARD, AND LARD OIL, &c.

It could scarcely be imagined, when this subject was first noticed in the report for 1841, that in two years so great improvement would have been made, and the business so widely extended, as has been the case. The predictions then hazarded have been more than verified, and a new and most important article of consumption in our country, and trade with foreign countries, has been added to the productions of the United States. It will be seen, by reference to the letter of Mr. Stafford, in appendix No. 20, that the amount of lard and tallow worked into oil, and stearine candles, in the vicinity of Cleveland the past year, is 250 tons; while the year before it was only 80 tons. The process adopted with respect to sperm oil, in producing stearine, has not been found to answer with regard to lard and oil, on account of the different mode of their crystallization. Compression answers in the former case; but in the latter it has a tendency to confine the fluid parts that may be separated. The usual modes,

by the use of alcohol, camphor, acids, and alkalies, are found too expensive; but, by the improved method described by Mr. Stafford, a more beautiful article, clear, and capable of enduring a temperature of 20 degrees, is said to be produced. The oil which he mentions, which is superior in appearance to the sperm-oil of the stores, may be seen at the Patent Office. The reputation of lard at the east is said to have been injured by the shipping of a bad article, which could not be sold at home. As soon as by the investment of large capital, the sufficient quantity of the uniform quality to supply the demand can be furnished, the article will, no doubt, be used in the manufactories of the east, to a much greater extent.

The candles of stearine sell, it is said, at from 15 to 20 cents per pound, by the box; and, in light, are equal to the first quality of tallow candles, but last twice as long, and are not greasy in warm weather.

Mr. Stafford states the price of lard at 4½ cents per pound, and says that, from May to August, he worked the average of 3,500 pounds per day. The fattened hog can be turned into the steam tub, (hams, blood, entrails, &c. excepted,) separated by heat—the fat from the lean, bone, and muscle—and 12 hours after, the fat is cold, and candles can be produced. The light-house and beacon at Cleveland have been exclusively supplied with lard-oil, since the opening of navigation, for the past year. Mr. Stafford further says, as will be seen by reference to his letter, that "assuming pork to be worth $1 50 per cwt., by his improved process he could deliver, for light-houses, the first quality of lard-oil in New York, at 37½ cents per gallon, and candles, as described, at 12½ cents per pound, and leave a good broad margin for profit." Mr. Wing's letter, also, which will be found in appendix No. 21, gives a statement respecting this subject in Cincinnati. By his account, there are four establishments for the purpose of manufacturing lard by steam in that city. It is said to succeed admirably, making it perfectly white and pure; the process, too, proves a great saving of expense, as well as furnishes a larger quantity from the same amount of pork.

For the conversion of lard into oil and stearine, there are, in Cincinnati, not less than 13 factories in full operation, making from 300 to 2,500 barrels each in a season, or 100,000 gallons. The oil sells there at 60 cents per gallon, by the barrel, and 75 cents by retail. The stearine made by one establishment amounts to 750,000 pounds per annum, two-thirds of which (the summer) is suitable for making candles. This stearine sells at 7 cents per pound; and the winter, which is used for culinary purposes, is equal to the best leaf lard, and sells for 6 cents per pound, when well put up in kegs for shipping.

Lard-oil is also manufactured in Columbus, Ohio, Wheeling, Va., Pittsburg, Pa., Indianapolis, Ia., St. Louis, Mo., Springfield, Ill., Nashville, Tenn., New Orleans, La., Rochester, N. Y., New York city, and various other places.

Lard may be cured in the summer, also, by being tried and cooked till the cracklings rise to the top; then putting the keg into cold water—if from the well, pouring it in several times; and if from the spring, by letting it run around the keg; and, after it is once thus cooled, it will keep.

The recent improvements on lamps, by which the principle of the solar and argand lamp is introduced into lamps for the purpose of burning lard, will be a great saving to the people of this country.

By experiments lately tried in Philadelphia, at the Franklin Institute, with Cornelius's lard lamp, it is found that one pound of lard yields an

amount of light equal to that of one pint of the best sperm-oil; the light was measured with great care every fifteen minutes for 7 hours. For the report of a committee of this institution, see appendix No. 22.

By a recent experiment in Cincinnati, a large steam bagging factory has been lighted by 76 burners, at an expense of $1 35, 4 hours in 24; and it is estimated that 3,000 burners might be supplied by machinery, which would occupy not more room than 4 feet square and 10 feet high. It is believed, therefore, that hotels and large establishments may yet find this application of lard in gas for light, most useful; and it will, very generally, be resorted to as a cheap mode of effecting this object. The paper appendix No. 22 contains the particulars, to which reference may be further made, together with an extract from a patent in England.

The importance of this subject (of gas light) may be perceived by adverting to the fact, that in the city of London and its environs, where gas is extensively used, the consumption yearly is estimated at not less than 3,000,000,000 of cubic feet; and the light produced by its combustion may be considered equal to what would be obtained from 160,000,000 of pounds of tallow candles. The annual consumption of coals in the various London gas-works is said to be about 250,000 chaldrons; and nearly 900 tons per day are consumed in foggy weather. If lard, therefore, can be used for the manufacture of gas at a cheaper rate, the market of the article so applied in England will be almost without limit. Three cubic feet of gas is said to give a light in an hour equal to that of ten candles. It is true, that electric light may yet be substituted for gas, as the recent experiments in Paris seem to show it to be possible, and that the expense of the same is not more than a twentieth part of that which is required for gas light.

KILN-DRIED MEAL AND FLOUR.

Some interesting facts have been obtained with reference to the subject of *kiln-dried meal and dried flour*, by which it appears that these have been sent to the warm countries uninjured, and a new extension of trade in this article may be confidently expected. The extract from Mr. Gill's letter and accounts of sales, which speak of this subject, will be found in appendix No. 23; by these it appears that, in the southern and South American ports, the article was kept in good merchantable order, and thus ready to be shipped again for other ports, and in weather in which other flour not thus prepared invariably spoiled.

Mr. Gill had the meal made up into bread and mush, which were both sweet and light—superior, he says, to any common manufacture of meal. He intends, as a further trial, to keep part of it for two or three years. Kiln-dried meal is also prepared in Illinois, and a shipment is mentioned in the public journals of 396 barrels manufactured at Carrollton, in that State, for the West Indies. A specimen of kiln-dried meal has kept at the Patent Office perfectly good for one year and a half. The expense of drying is said not to be great; and as the difficulty of keeping has hitherto prevented as profitable a trade as might have been carried on otherwise, large quantities may now be exported.

It takes 5 bushels and 10 lbs. of common wheat to make one barrel of dry flour; 4 bushels and 45 lbs. for common good flour. The process is by hot air, and 18 lbs. are thus dried out of a barrel. The expense of the apparatus is said to be about $300. Corn meal is dried in the same way. The excellence of the flour has been tested by bakers, and it is said 16 lbs. more of bread is made from a barrel of flour. The reason why flour and meal

spoil, is, that they are liable to become sour; this difficulty is remedied by Mr. Gill's process. The English prejudices against the use of Indian corn meal cannot be overcome, unless the article is sent to England in a state equally good with that used by our own people.

FEEDING OF CATTLE.

The subjects of the *economical feeding of cattle, and of manures*, deserve more space and attention than we can now devote to them as connected with this view of the agricultural progress of the country. During the winter of 1842–'43, great numbers of cattle perished for the want of sufficient food. This was doubtless owing to the too great dependence placed on some particular articles of fodder, and the severity and length of the winter, which shut them up from the pastures. A more careful economy of winter food, by using at the periods of fall and early winter that food which would answer less for the severe cold weather, with greater attention to the warmth of the animal, might do much to prevent the occurrence of such a time of distress as prevailed in some of the more northern of the western States last winter. The proportions of nutritious substances found in the different kinds of fodder, and the amount needed for the conservation of the animal, (or *conservation fodder*, as it is sometimes termed,) should be known, and thus substitutes may be resorted to in such a manner as to avoid the greatest inconveniences of an unlooked-for period of cold weather.

The following table will furnish the relative value of a few of the principal articles of fodder, as determined by experiment:

100 lbs. of good hay are equal to—

- 275 lbs. of green Indian corn,
- 442 lbs. rye straw,
- 164 lbs. oat straw,
- 153 lbs. pea stalk,
- 201 lbs. raw potatoes,
- 175 lbs. boiled potatoes,
- 339 lbs. mangel wurtzel,
- 504 lbs. turnips,
- 54 lbs. rye,
- 46 lbs. wheat,
- 59 lbs. oats,
- 45 lbs. peas or beans,
- 64 lbs. buckwheat,
- 57 lbs. Indian corn,
- 68 lbs. acorns,
- 105 lbs. wheat bran,
- 109 lbs. rye bran,
- 167 lbs. wheat, pea, and oat chaff,
- 179 lbs. rye and barley,

16 lbs. of hay is equal to 32 lbs. of potatoes; and 14 lbs. of boiled potatoes will allow of the diminution of 8 lbs. of hay.

An ox requires 2 per cent. of his live weight per day in hay; if he works, 2½ per cent; a milch cow, 3 per cent; a fattening ox, 5 per cent. at first, 4 per cent. when half fat, or 4½ average. Sheep, when grown, 3½ per cent. of their weight in hay per day.

In wintering of stock, there is yet room for great improvements, by providing good warm shelter or stabling for animals, and boiling, grinding, or

baking the food prepared for them. Grinding the cob with the corn is said to add one-third to its value for feeding, and the converting the straw or cornstalks fed out into chaff before using them, is equally beneficial. Much valuable information on these subjects is found in the agricultural journals and publications which from time to time are issued from the press in our country. It is mentioned in one of them that stock of all kinds require to be salted at least three times a week; and if, instead of this, equal parts of salt, lime, and ashes are mixed together, the compound would not only be cheaper, but more healthful.

An able writer says, "there is a positive loss, a needless throwing away of 20 to 50 per cent. of the food in wintering domestic animals, which is literally burned up by nature, in this cold climate, to keep their blood and the whole animal some 40 or 80 degrees warmer than the temperature of the air by which they are surrounded. It is not merely the hay, oats, and corn in domestic animals, and the bread and meat in man, (which are consumed like the animal oil in a lamp, to warm the system,) that are lost, but, by inhaling a cold and dense atmosphere, and bringing a larger amount of oxygen gas into the lungs, and through them into the blood, than is needed, inflammations are generated, ending in consumptions alike in man and beast. Exercise increases the motion of the respiratory organs, and the consumption of animal fat. The food that will keep a horse fat in a warm stable, will hardly prevent his starving when driven 35 or 40 miles a day. In the latter case, he will expel twice as much carbon from his lungs as in the former; and the excess of heat in the system will pass off in a copious perspiration, and in the discharge of much vapor from his nostrils. All our domestic animals, then, are living furnaces, which will have to be warmed by burning hay, oats, and corn, for the next six months." He adds, that he could prove from accurate experiment, and facts well known, that in the State of New York alone, the loss from inattention to warmth of cattle will be equal to $5,000,000. He calls on the farmers: "Bank up your stables if they need it, ceil them with rough boards on the inside, and fill in the space with tan bark, horse dung, pea straw, or some other non-conductor of heat. Keep all your domestic animals *warm*, *dry*, and *quiet*, if you desire them to yield the largest return in fat, tallow, milk, butter, cheese, and wool, from any given amount of suitable food."

A striking example of the importance of shelter for cattle is presented by the success that has attended keeping calves over the winter in cornfields, on the prairies, where the winds are proverbially bleak; the stalks break off the wind, while the calves eat of the stalk and the corn what they please, and keep fat without doing much injury to the crop. In travelling in the valley of the Wabash in May and June, people may be seen picking and shelling the corn in one part of the field which is to be planted in another; the loss is found to be less than might be supposed, deducting the ravages committed by the birds and wild animals.

Professor Playfair remarks on this subject: "Heat is, therefore, an equivalent for food; and by a knowledge of this fact, we may economise the latter very considerably. We know that cattle fatten much more slowly in winter than in summer; the reason being, that part of the food is expended in the production of the necessary heat. Lord Ducie was kind enough to communicate to me an experiment of his, in which 100 sheep were fed in the open air, and another 100 in the same space, with sheds to retire into at pleasure. The first lot ate 25 lbs. of Swedes per day; the latter only 20 lbs.,

although this lot, with 5 lbs. a day less, had gained an average of 2 lbs. per sheep more than the last, at the conclusion of the experiment." Some other experiments of Lord Ducie are thus given:

"*1st experiment.*—Five sheep were fed in the open air between the 21st of November and the 1st of December; they consumed 90 lbs. of food per day, the temperature of the atmosphere being about 44 degrees. At the end of this time they weighed 2 lbs. less than when first exposed.

"*2d experiment.*—Five sheep were placed under a shed, and allowed to run about at a temperature of 49 degrees; they consumed at first 82 lbs. of food per day, then 70 lbs., and at the end of the time had increased in weight 23 lbs.

"*3d experiment.*—Five sheep were placed in the same shed as in the last experiment, but not allowed to take any exercise; they ate, at first, 64 lbs. of food per day, then 58 lbs., and increased in weight 30 lbs.

"*4th experiment.*—Five sheep were kept quiet and covered, and in the dark; they ate 35 lbs. a day, and were increased 8 lbs."

MANURES.

The science of chemistry, applied to agriculture, has furnished analyses of soils, and, by determining the nature of the elements or constituent parts of the various kinds, and the combination of these also in the vegetable productions, has enabled many to judge as to what are the elements needed to be supplied in the form of *manure.* Similar investigations have been made, into the character of the substances generally used as manures; and the result has been, to develop the principles which constitute more especially the nutritious parts of these fertilizers of the soil. Many substances, before unknown as respects their practical bearing in this point of view, have, on trial, proved to be very valuable; and after the analyses have been completed, and the elements known, it has been found that new combinations, still more effective, may be made at a less expense than the natural ones. In bulk, too, manures are thus very greatly reduced, as the essence of the principle by which the plant is nourished is extracted, and applied without the adjuncts which are usually found with it. Very astonishing results have been produced by the application of some of these manures to lands well adapted to them.

The various *salts* reduced to a small space now afford great fertilizing power. The value of *urine*, as a manure, is beginning to be appreciated. For a long time, both in Europe and in China, it has been greatly esteemed as a means of enriching land. A single cow, it is stated, will produce in a year 13,000 weight of urine, and this contains 900 lbs. of solid matter finely dissolved, including 230 lbs. of ammonia. From a course of experiments tried by the application of 100½ cwt. to the acre, the following results were obtained:

An acre undressed, produced—	
Wheat - - - - - - -	44 bushels.
Oats - - - - - - -	49 bushels.
Turnips - - - - - - -	12¼ tons.
Potatoes - - - - - - -	12¾ tons.
An acre dressed, produced—	
Wheat - - - - - - -	54½ bushels.
Oats - - - - - - -	50 bushels.
Turnips - - - - - - -	24 tons.
Potatoes - - - - - - -	14½ tons.

The celebrated Arthur Young manured four equal portions of a field—one with dry straw; another with straw soaked with fresh urine 5 hours; the third, with straw thus soaked 15 hours; and the fourth with straw thus soaked for 3 days; and a fifth he left without anything. All were sown with grain, and tilled alike. The result was, that the first product was 30, the second was 50, the third 63, the fourth 126, and the fifth only 9.

The great quantity of nitrogen contained in the urine of animals is considered the cause of their beneficial action on soils. Urate, which is a salt manufactured and sold as a manure, it is stated cannot fully supply the place of urine. Human urine is said to contain in 1,000 lbs., at least 68 lbs. of dry fertilizing matter of the richest quality, worth $5 per hundredweight. The urine alone discharged into rivers and sewers by a town population of 10,000 inhabitants, would supply manure to a farm of 1,500 acres. The excrements of a single individual, it is supposed, are sufficient yearly to yield the requisite nitrogen to an acre of land.

Soot and charcoal are also excellent fertilizers. According to an able writer on this subject, 100 lbs. of soot, by analysis, has been found to contain as many valuable salts as a ton of cow dung; and its nitrogen compared with that manure is as 40 to 1.

In an experiment, tried by Mr. Sinclair on potatoes, the soil without manure yielded - - - - - 157 bushels per acre.
With 30 bushels of soot - - - - 192 bushels per acre.
With 30 bushels of soot and salt, (8 bushels) - 210 bushels per acre.

Charcoal has been before mentioned, and the great increase of the wheat crop in France, from the employment of this substance, stated. By the use of charcoal and lime, in the State of New York, a crop of wheat at 78 bushels to an acre has been obtained.

Common salt is likewise a powerful species of manure; combined with soot, as stated above, its effect is great. Mr. Sinclair gives the following experiment on carrots:

Soil without manure, produced over - - - 23 tons per acre.
Soil with 6½ bushels of salt dug in - - - 44 tons per acre.
Soil with 6½ bushels of salt dug in, and 6½ bushels of soot - - - - - - - 40 tons per acre.

A striking experiment on the application of *nitrate of soda* is thus stated:

"On the 6th of last May, five alternate ridges of wheat, measuring 1 acre 2 roods and 4 perches, were sown with 500 cwt. of nitrate of soda in a field. In a few days the difference between the ridges sown with nitrate and the intervening ridges of the same, could be discerned at a considerable distance from the field; which continued through the summer. The two sorts have been reaped, threshed, measured, and each weighed separately, and the following is a correct account of the produce: Nitrate—49 bushels: weight per bushel, 56 lbs.; of straw, 2 tons 4 cwt. 3 qrs. and 5 lbs. The other 23 bushels: weight per bushel, 55 lbs.; straw, 1 ton 5 cwt. 1 qr. and 2 lbs."

By the experiments of MM. Payen and Bousingault, it appears that so far as relates to the quantity of nitrogen contained, the following proportions of certain articles exist to 100 lbs. of farm yard dung:

	Moist.	Dry.
Pea straw - - - - - - -	22	100
Wheat straw - - - - - -	166	650
Rye straw - - - - - - -	235	975
Oat straw - - - - - - -	142	541
Barley straw - - - - - -	173	750

	Moist.	Dry.
Wheat chaff	47	207
Green beet leaves	80	43
Potatoe	72	84
Carrot	47	66
Buried clover roots	24	110
Dunghill drainings	67	126
Solid cow dung	125	84
Mixed cow dung	97	75
Cow urine	90	51
Solid horse dung	72	88
Horse urine	15	15
Mixed horse dung	54	64
Mixed pig dung	63	57
Mixed sheep dung	36	65
Liquid Flemish manure	210	
Oyster shells	125	487
Marl	78	
Blood soluble	3	12
liquid	13	
dry insoluble	2	11
Bones boiled	5	25
moist	7	
fat	6	

The astonishing fertilizing power of the manure called *guano*, which is found in such vast quantities on the coast of Chili, and other parts of South America, and is, doubtless, the deposite of immense numbers of birds for ages, has excited much interest in this country, as well as abroad. An artificial kind is manufactured in England, which is said to answer as well as the natural, and is to be obtained at a less price. Guano is stated to be found, on analysis, to consist of certain ammoniacal and earthy salts, together with a small quantity of animal matter; but the proportions of the different substances are said to vary in different specimens submitted to the test. It is a very strong manure, and must not be used in large quantities. To obviate this difficulty, the artificial guano has been prepared in England. A great number of varied experiments have been tried with guano. It is said to be well suited to the humid climate of Great Britain. It can only be drawn out of the soil by the crops, by a course of years. It may either be used alone, or with other manures, and is generally used in the form of a powder. The price of it in Peru is often about $2 50 per cwt. The general price in the South American ports is about 66 cents per cwt. Some comparative experiments are mentioned as tried in England on turnips. Thus, where was used

	Per acre.	Per acre.
Farm yard manure,	20 tons, the product was	18½ tons in bulbs.
Bone dust	40 bushels, the product gave over	14¾ "
Soot	50 bushels, the product gave over	16 "
Guano	3 cwt., the product was	23 "
Wood ashes	20 bushels, gave a product of	32 "
Nitrate of soda	1 cwt. gave a product of	27 "
Sulphate of ammonia	1 cwt. gave a product of	24½ "

In another experiment, it is stated that 30*s.* worth of guano gave a better crop than £7 worth of farm-yard manure. The great effect of guano was decisively shown in a public garden, lately, in Boston. Two seeds of sweet corn were planted May 12th, in a poor, sandy soil. One was without any manure, and produced but one stalk, which had on it one ear, and which weighed $1\frac{1}{4}$ pound. The other, manured with guano, produced eight good ears, and four or five useless ones, and weighed eight pounds. Only two spoonfuls of guano were used on the hill. By the experiments of General Beatson at St. Helena, the comparative produce of potatoes from different manures was—

	Bushels.
Guano, at 35 bushels per acre - - - - -	639
Horse dung, at 35 cart-loads per acre - - - -	626
Hogs' dung, at 35 cart-loads per acre - - - -	534
Simple soil - - - - - - -	446

According to the analyses of MM. Voelchel and Klaproth, the varieties of guano which they examined contained—

	Voelchel.	Klaproth.
	Parts.	Parts.
Urate of ammonia - - -	9.0	16.0
Oxalate of ammonia - - -	10.6	0.0
Oxalate of lime - - -	7.0	12.75
Phosphate of ammonia - -	6.0	0.0
Phosphate of ammonia and magnesia	2.6	0.0
Sulphate of potash - - -	5.5	0.0
Sulphate of soda - - -	3.3	0.0
Chloride of sodium (common salt) -	0.0	0.5
Chloride of ammonia - - -	4.2	
Phosphate of lime - - -	14.3	10.0
Clay and sand - - - -	4.7	3.2
Undetermined organic substances, of which about 12 per cent. is soluble in water, a small quantity of soluble salt of iron, water - - -	32.53.	28.75.

In a few words, it may be regarded as a compound of urate of ammonia and other salts.

Mr. Johnston gives the following mixture of the various ingredients found in guano as likely to prove equally efficacious with the natural guano for all the crops which have been tried with that manure.

315 pounds (7 bushels) of bone dust.
100 pounds of sulphate of ammonia, containing 35 pounds of ammonia.
5 pounds of pearlash.
100 pounds of common salt.
11 pounds of dry sulphate of soda.

531 pounds of artificial guano.

This may be mixed intimately with 100 pounds of chalk, and it will then, he adds, be equal in efficacy, I believe, to four hundredweight of guano. The price of this composition he estimates in England at somewhat over five dollars, and the four hundredweight of guano he mentions is now selling at twenty-five dollars.—(See also Appendix No. 24.)

Blood is likewise stated to be an excellent manure. Three thousand pounds of liquid blood give seven hundred and fifty pounds of blood coagulated and dried, which is said to be sufficient for an acre. One hundred pounds of blood is thus, it is added, equal to three hundred pounds of bones crushed, or three loads of good horse dung, weighing 7,200 pounds. It is so valuable to sugar canes, that it has been sent from Paris, where it costs two dollars, to the West Indies, where it is sold at four dollars per hundredweight. The vast quantities of blood which are produced by the slaughter of hogs and cattle at the west, may be reduced to a dry form, and find a ready market as manure, both at home and abroad. An English gentleman, manufacturer of artificial guano, suggests to the Commissioner of Patents that many tons might be sold in that country. He says that for his purposes, the blood must be exposed to a steam heat until it ceases to lose weight, and moved about while drying, so as to form, when dried, a coarse powder. He says it would be worth $25 per ton.

The utility of green manuring by ploughing in a crop, has long been acknowledged; and these rotations are some of the means the farmer can employ for the purpose of enriching his land.

A practical farmer states, as the result of his experience, that a crop of turnips, when buried leaf and root, will be found superior to almost any other that can be obtained for the purpose of ploughing in as a green crop for manure.

Professor Liebig says: "While the straws of the grain-bearing plants afford for every ton of green crop turned in about three-quarters of a pound of ammonia, green corn stalks and herds grass about five pounds of ammonia per ton, red clover affords seventeen pounds of ammonia per ton. This shows the great value of clover."

In appendix No. 24 will be found an account of a process for rapidly making manures, which is generally known as Jauffret's patent mode, which was patented in England by Mr. Rosser. Some account of his experience in preparing manures is also added.

Some remarkable experiments have been tried recently with various articles of manure, among which may be mentioned those of M. Auber, in France, on potatoes. Abundant crops of potatoes were grown in poor clayey soils, by simply strewing the sets plentifully with rye chaff previous to covering them with earth at planting.

Professor Voelker, of Germany, covers potato sets with a layer of tan-bark two or three inches thick, before turning the furrow over them.

Another discovery, said to have been recently made in France, is the following, by which a good crop of wheat, it is asserted, may be obtained. The grain is placed on the ground, and upon it is placed a layer of straw an inch thick. It is left to grow without culture, and the production is abundant. The straw preserves the moisture of the soil, and thus facilitates the absorption of the gasses necessary for the nurture of the plant, and, slowly decaying, furnishes thus its necessary food. This plan might be applied to wheat, and perhaps might prevent the disastrous effects of winter killing.

While many have thus been pushing their researches into the nature of manures, and their adaptation to soils and products, a German residing in Vienna, named Bick, is said to have succeeded in raising good crops on poor and sandy land, without any manure applied to the land. His method is the application of nutritious substances to directly the seeds themselves, and by such a preparation the necessity of anything further is prevented. He has given an account of his experiments and results in a little work published in Germany, accompanied by certificates of the truth of the statements.

In connexion with the subject of agriculture, might be mentioned the great perfection which has been attained in the manufacture of AGRICULTURAL IMPLEMENTS, and the extension of this business in our country. A great number of excellent and improved ploughs, cultivators, spades, hoes, rakes, reaping machines, forks, and other articles required by the farmer, are thus prepared and ready for each coming season of their use. As an example, may be mentioned that, in Kennebec, Maine, a single establishment, the past year, manufactured 4,000 dozen scythes, and next year they intend to manufacture more.

HOME MARKET.

The interchange of the various articles of produce in our country is becoming greater each succeeding year. As there is such a diversity of climate, there are, of course, some products which are confined much to particular sections of the country. The staple crop of one State thus finds a market in another, where it cannot be cultivated, or as well prepared. There are numerous objects which demand to be supplied. The consumption of many products is, in part, confined to the place where they are raised; but, in a great number of cases, there is a surplus of agricultural produce, and there are various channels opened by which a portion of this surplus may be disposed of. The home market is based on the demand on the articles for food or for manufacture. In proportion as the agricultural population have their attention turned to other objects, they will, of course, add to the amount required for consumption. This they will do by the use of the various products as food, and also as the raw material, which is to be wrought up for the purpose of trade. There is thus a double action going on. The individual, once a producer and a consumer in part, as it may be said, of his own production, or the particular crop raised by his industry, ceases to aid in the production of that article, and becomes the consumer of that which is raised by some other. If, for instance, his consumption of wheat flour by himself and family equalled 10 barrels a year, then the 10 barrels, or their equivalent in wheat, which he once raised, must be raised by some other wheat-grower. The same is likewise the case in the diversion of labor in any instance to another crop. The state of our country in this respect is encouraging. New branches of industry are claiming the attention of our people in various sections of the Union. Improvements are going forward, and distant States are becoming connected to each other by extending lines of railroads and canals, which are burdened with the vast quantities of agricultural products that are hurrying to the market, created by the new impulses of skillful industry in the various methods of fabrication; while a tide of emigration from abroad, hungry mouths and sturdy limbed, is pouring on our shores; and these, if employed

among us, must likewise be fed. The home consumption of articles of agricultural products is increasing; and, especially when certain portions of our crops have fallen off, the prospect of demand has become yet greater. Still we are not wholly cut off from other channels by which to dispose of our surplus product. Though the ports of foreign nations are not fully opened to us, yet some of the articles furnished by agricultural industry find an increased demand abroad.

FOREIGN MARKET.

If we inquire as to the probable fullness or scarcity of the crops of our foreign customers, we find that the wheat crop of Great Britain was short of the usual one. A writer for the Farmers' Magazine for December says: "The quantity of the wheats delivered by the farmers, during the last month, has not improved. On the contrary, the samples generally have been not only affected by the weather, but, we regret to add, some proportion of them must have been more or less injured before the reaping season commenced. We therefore fear much that the deficiency in the quantity grown last season in the home counties, and in all the corn districts south and west of the metropolis, cannot, in any manner, be made good by superiority in quality, as was generally expected at the conclusion of the last harvest."

"This," it is observed by another, "combined with the falling off in the supplies, owing to the prevalence of damp weather affecting the condition of the grain, which has induced the farmers to refrain from threshing, has prevented any decline in prices during the month of November, and, indeed, has at Mark Lane, and some of the leading provincial markets, caused an advance. The price of wheat on Monday, November 27, varied from 43 to 63 shillings per imperial quarter of 8 bushels."

It is said, by one authority, that the breadth of land put under the wheat culture during the year 1843, is comparatively small. England, therefore, in 1844–'5, must depend on foreign countries for a larger supply than usual. Probably this may lead to an increase of prices. The Mark Lane Express of September 25th stated that the acreable product of wheat was deficient in many parts of the country. The amount of foreign wheat on hand is much less than usual; and, as a considerable portion of the home crop was harvested in a bad condition, it would be necessary to mix with it foreign wheat for grinding. It was therefore certain, according to the views of the writer, that the demand for foreign wheat would increase for some time to come.

On the other hand, another writer at Liverpool says, under date of January 4, 1844: "Autumn tillage, which, in this direction, was nearly suspended by the heavy rains in October, has been completed under the most favorable circumstances during the fine, mild, open weather of last month; in the course of which, a much greater breadth of land than usual has been sown with wheat, and the plant upon the ground is uniformly reported to exhibit a healthy appearance, though in some situations too forward for the season; the new year, however, has set in with frost and snow, giving a timely check to premature growth in such instances."

European crops on the continent do not seem to have been so abundant as to furnish any great surplus for foreign export.

The wheat crop in Lower Canada, under date of October, is said to be good, and that the province will have enough to export to their neighbors,

'tead of being compelled to purchase of them. Later, however, the news 'hat the potatoes and some other crops were frozen in. The crop in Canada is stated, also, not to have been an average one.

rade with Canada the last year has not been so large as was ex- consequence of the more direct trade by the Atlantic ports hav- ferred. Indeed, as it appears, there has been a decrease of way of Cleveland, in all the articles on the list, of more than dollars. The deficiency is more than covered by that on at flour and pork. The colonial duties which have been prevent the produce of the States from finding its way to ian, has no doubt operated unfavorably on the trade wit ; yet, by the means of canals and railroads, the freigt ay of Montreal, may be so far reduced that the amoun ng the foreign market through that outlet may be increasea. kness with which the steamers from Boston and New York can c articles of export to England when there is any demand for them, pr ably creates a preference for those ports. Much often depends on this, as before thirty or forty days the article which might find a ready market may be down flat and unsaleable. The comparative list of tariffs (appendix No. 25) will show the rates of duties of a number of articles in foreign ports. A variety of *pro-forma* bills of sale, and the price of freights of different articles to England, will also be found in appendix No. 26.

As most of the principal articles to England are sent to be put in bond for reshipment, and thus are not subjected to duty, it is obviously cheaper to ship them direct than through the Canadas. The lateness in the spring with which the St. Lawrence is free from ice, and the fact that it is so early closed towards the advance of winter, forms another reason why that course of transportation has been a less favorite one than some others. By a reference to the report for 1842, a variety of particulars, as to freight and expenses and markets, may be found, which should be kept in mind in the consideration of this subject. The new provincial tariff has received the royal assent. Some further particulars on these subjects may also be found in appendix No. 27.

The alterations of the British tariff, which first came into effect last season, and by which some of the articles of the provision are received in the ports of England on more favorable terms than before, has caused the attention to be turned to the state of the English market, more particularly with respect to some articles. Great pains have been taken by the Commissioner of Patents to ascertain the defects of our shipments in the foreign market; and much valuable information has been collected, which will be found in appendix No 28, relating to the methods of preparing beef, hams, and pork, and other articles. If we enter into competition with others in foreign markets, we must be willing to conform ourselves to their prejudices as to taste, and so suit our modes of preparation to these, that no objection shall arise to our shipments on this score. Whether or not we deem their wishes reasonable, they will purchase only just so far as they are pleased with the article we send. American produce, while it was excluded, was generally ridiculed; but later advices, speaking of articles admitted, show that it is becoming more acceptable, and only needs to be prepared and packed in the manner specified by those conversant with the English market, to find a respectable sale. The people of this country have had a

very imperfect idea of the wants of England in this respect; her crop is deficient, and she must in a degree depend upon others. The instance before mentioned, of the disproportionate consumption in London of cheese to that of butter—the former being 38,000,000, and the latter 19,000,000 lbs.—is an illustration of the remark just now made. Several new articles are shipped from time to time, and others may be added to the list. Cranberries are now shipped not only to the southern ports, but to the West Indies, Europe, and the East Indies. Cheese is likewise sent to China, and promises to prove a profitable article of trade. The forest of this country can not only supply ashes, but we may also prepare and send out dyes. The freight of some of these things, in the form of extracts, is already attracting attention. Oak bark, which in the interior is worth from $2 to $3 per cord, in New York is sold at $8; and a ton equal to 2½ cords will yield 300 lbs. of extract, worth 15 cents per pound: thus amounting to $45. We have already mentioned that England annually imports 40,000 tons of oak bark.

PROVISION TRADE WITH ENGLAND.

The interest of the English people was much excited as the time (the 10th of October, 1843) approached in which the reduced duties on salted provisions should take effect. Unfortunately for us, the greater part of the United States meats were prepared before any change in the tariff was expected. The sale was attended also by gentlemen from Ireland, who went to watch the operations of a new trade, which might threaten their former exclusive privileges. The account of the sales, and the estimate of the American provisions brought into market by the new act in various places, will be found in the extract from the Liverpool Courier, (appendix No. 29.) This was the first judgment. Subsequent opinions are still more favorable. Some of these commendations run thus: Mr. Du Croz said "the American pork is the best in the world; it is principally fed on maize, and at certain periods of the year nothing can be finer." Again: "Within the last few days 204 boxes of American cheese have been received in Liverpool. Every year the quality of the American cheese improves. Another article which is arriving in very large quantities is American lard, which is coming into use for many purposes for which salt, and even fresh, butter has been employed. Very excellent salted beef has come from the United States in considerable quantities." "Some really fine dry canvassed hams having arrived, sales have been made to a considerable extent. With a moderate supply of a similar quality, these rates may be maintained." "We have lately had a few small parcels of superior hams, (Cincinnati cured,) which have brought 60*s.* to 63*s.* per 112 lbs., (duty paid,) or 46*s.* to 48*s.* in bond. The quality is much approved, particularly Yeatman's cure. All hams must be in canvass, neatly covered, handsomely marked, and shipped loose." "The opinion we have often expressed, that fine hams would command a high price, has at length been realized. A small lot of 100, from New York, well cured, sewed in canvass, and loose, has found a purchaser at 48*s.* in bond, or about 62*s.* 8*d.* duty paid. Tallow, (United States:) We have pleasure in drawing your attention to this article, inasmuch as we are of opinion that it is likely to become an article of considerable importance." A Liverpool paper, speaking of the effect of the new trade on Ireland, says: "The recent large importations of American provisions of good quality into this port, which have been eagerly sought after, has attracted a good deal of

attention in Ireland, and the farmers of that country are considerably alarmed lest the Americans should cut them out of the English market." The following remarks are thus quoted from the Dublin Monitor: "The Liverpool papers inform us that large quantities of American cheese have arrived at that port, and been sold at a price far below that which the Cheshire farmers could offer. The tariff has made no change in this article, and the duty remains the same; and the importation shows the formidable rivalry which the English farmer has to expect from Brother Jonathan.

"Another article (lard) is being imported in considerable quantities, which will seriously affect the price of Irish butter. The poorer classes of consumers find in this an excellent substitute for butter, so that it is likely to displace a large amount of our southern produce, being purchasable for about one-third the price of butter; and though not so wholesome or nutritious, yet the difference of cost will bring it largely into consumption.

"Salted beef is another item, the introduction of which will seriously damage the Irish farmer. At many of the agricultural dinners, both in England and Ireland, the idea of American beef and pork superseding native produce was heartily laughed at. Bating the quantity, (which, it was said, was very insignificant, and not at all calculated to excite alarm,) the *quality* was of the very worst character. The fat (it was said) dissolved away like snow; it did not preserve its firmness, like the British fat; and as to the lean, it was hard and indigestible as American iron-wood. Now, the fact is, the different curing and packing was the cause of the inferiority of American beef and pork. In their hurry to seize the English market, they did not provide for the English taste. They now have been taught by experience; and the consequence is, that the late importations are of good quality and flavor."

The London Farmers' Journal says: "We declare, and stake our reputation on the averment, (for we speak from personal experience, obtained in almost every State in the Union,) that finer meat than the American Indian-corn-fed pork cannot be found."

In Wilmer and Smith's European Times of January 4, 1844, the latest advices we have had at this time, it is said: "The trade in American provisions, in our report of the 3d of January last denominated as 'yet a new one,' has, during the year just closed, made rapid strides. Some of the articles must now rank as staples of large and positive consumption, whilst many of the others are daily growing into favor. With our working population in the manufacturing districts well employed, prices generally low, and money easy, a large, steady, and profitable trade, for well selected articles, may be safely anticipated. It being now established that really good and well-put-up beef can be had from America at a lower price than Irish, the prejudice against the articles amongst ship-owners is fast giving way; hence there is a regular demand from the trade, and the highest quotations are obtainable for a really fine article. For really well-selected fine cheese there continues a steady demand, and for such full prices are obtained."

Many similar quotations might be given, but these are sufficient to assure the agriculturist that an extensive trade may be opening upon him. The feeling in England, since the successful introduction of American produce, is setting yet stronger towards, if not the repeal, the more favorable modification of the corn laws; and Sir Robert Peel, it is said, has determined on proposing such a change as the repeal of the sliding scale, and the imposing

of a fixed rate of duty on wheat. By the operation of this law, bread is said to be 41$\frac{5}{8}$ per cent. dearer in London than in Paris. The unsettled state of Ireland, too, may have an effect on our provision trade. Should a collision occur between the different parties there, the interruption of Irish supplies in the English market must necessarily follow. The opening of the China trade to English manufactures will, no doubt, create a greater demand, not merely on our cotton, but also on our articles of food. If the dried flour and kiln dried meal should be sent to England, and a good article in a state free from all tendency to sour be furnished, the class of people who now consume oatmeal for bread might be led to substitute the Indian corn meal. It is stated that, in one week, lately came into Liverpool 20,000 loads of Irish oatmeal. Now the analysis of both shows that oatmeal possesses but 75 per cent., while maize, or Indian corn, has 89 per cent. of nutritious substances. One-twelfth of Indian corn meal, it is stated, may be mixed with wheat flour for bread, without its being detected. This being the case, if its nutritious character and suitable preparation should recommend it as a cheap substitute for bread, as the article can be manufactured at a comparatively moderate expense, an extensive trade may grow up, to the benefit of our enterprising people in the maize growing States.

By reference to appendix Nos. 20 and 21, some interesting statements bearing on this subject, from Cleveland and Cincinnati, may be found.

From the letter of Mr. Milford, (appendix No. 30,) we learn that the freight of a tierce of beef from Cleveland to Liverpool, by way of New York, is \$3 47$\frac{1}{2}$; the duty is about 1$\frac{1}{2}$ cent per lb. It likewise appears, from the same letter, that there have been over 6,000 head of cattle this season slaughtered in Cleveland up to the 1st of January, 1844, and about 7,500 tierces of beef packed for the English market.

The cost of a barrel of beef or pork, from Cincinnati direct to England, is stated to be about \$1 75. The amount of hogs or beef slaughtered there, or in the vicinity, this season, so far, has not been obtained; but last year, in February, it is stated to have been, during the three preceding months, about a quarter of a million. The estimated amount of lard was 11,699,350 lbs., which, at 4 cents per lb., would be \$467,974. Besides this, there were daily arriving large quantities from the country, so that the whole value could not be less than half a million. Not less than 6,500,000 lbs. of lard, it is said, were sent to France. 90,000 hogs were entirely rendered into lard in Cincinnati and vicinity; the size and quality of them having surpassed those of the preceding year. The season, with the encouragement already furnished by the success abroad, has opened with more vigorous operations, and probably a great addition will be made to the amount of lard manufactured and forwarded to foreign parts. Vast quantities of hogs have, likewise, been packed, and hams cured. The following account of the prices of packing is taken from a Cincinnati journal of November last. They are said to be based on 60 cents per bushel for Turk's Island salt; 87$\frac{1}{2}$ cents for barrels; 28 cents for Kenhawa fine salt; and 75 cents to \$1 50 per day for laborers; and for receiving, weighing, and cutting the hogs, a block fee of 5 cents each.

For packing per bbl., including all charges, \$1 60 to \$1 75. For salting 100 lbs. in bulk, including saltpetre for the joints, \$1 62 to \$1 75. Smoking, per 1,000 lbs., including washing, \$1 25. Rendering into lard, 37 to 50 cents per 100 lbs., which does not include the price of the keg or

barrel; 2 to 5 cents is also charged on each keg or barrel for nailing the hoops, boring, weighing, and marking. The cooperage is charged at cost.

Various methods are adopted to prepare the best hams. The pork that is corn-fed, as we have seen, receives especial commendation in the foreign market. Other articles of feed, however, are sometimes used with much success. It is stated as a fact, on good authority, that near Dugsburg, in Westphalia, celebrated for its fine hams, the hogs are principally fattened on chestnuts and potatoes. The hogs are made nearly fat by running in the woods abounding with chestnuts and potatoes, and, when they cannot run at large, the nuts are gathered and fed to them in pens. In the last stage of fattening, after their range in the woods is over, they are fed on *potatoes which are baked.* Large ovens are used, and it is found that, thus prepared, the potato is the most fattening of all food, while the peculiar flavor of the hams is thought to be owing to the use of this root.

One or two receipts for curing hams, which are most highly recommended, are subjoined in appendix No. 31.

As there is reason to anticipate that the demand for American provisions will yet be increased abroad, it is desirable that efforts be made to procure and diffuse among the people all the information which may help them to understand any changes that may occur in the methods of preparation in the foreign market, and any new articles that may find favor in the different countries to which exports may be profitably sent.

The use of plank roads and Ericsson's propellers, (see appendix Nos. 32 and 33,) may also be used to facilitate the progress of our crops to the market, and, as invention proceeds, distance becomes more and more annihilated.

With increasing knowledge of the wants of our customers abroad, with a large surplus at home, and land not yet brought under cultivation, capable of producing the richest crops, and comprising many millions of acres, we can enter into competition, and hold ourselves in readiness to improve any openings that may enlarge our trade with foreign lands; while, by directing the energies of the nation to the sources of its prosperity, we may strengthen our independence, and secure our happiness as a great people.

The period of the experiment is indeed a fortunate one; we could scarcely ask for a better.

The vigorous enterprise of the west is already turned to the production and preparation of articles of traffic at home and abroad; the south looks up with cheered spirits and more buoyant hopes, from the increasing demand for her great staples; and the eastern and middle States, rallying their inventive skill, ready tact, and earnest purpose, rouse to new effort.

In this gathering of energy, agriculture is like the mighty heart of the nation, sending out healthful streams to every member; and, by its regular pulsation, marks with unerring truth the life that animates the whole system. Says an eloquent writer, "Agriculture is the resource of all men who are out of employment. It would seem as if the common Father of mankind, aware how machinery would be substituted for human hands, and how, in the progress of science, whole employments would be superseded by new inventions, and thus many channels of support laid dry, had reserved agriculture from liability to such mutations, as a standing inheritance and support for all his unprovided children."

The immortal patriot and father of his country felt the claims of this great branch of national industry, and added to example the labors of years to awaken a response in the bosom of her legislators in behalf of the un-

obtrusive but meritorious husbandmen, who are emphatically her support in peace, and her defence in war.

Happily, at length such an appeal is beginning to be heard, and the long-neglected claimant has gained the ear of statesmen. How proud a monument may now be reared to the skill and enterprise of this people! The trophies of art and science here gathered, will evince to the world that freedom and agriculture are congenial; and, where these are duly cherished, science, knowledge, and the useful arts flourish in their highest vigor of improvement.

APPENDIX.

No. 1.

From the Farmer's Cabinet.

CALICO CORN.

The readers of the Cabinet may be pleased in hearing of an article of grain that approaches nearer than any other in making flour and bread similar to wheat. I send a sample of the flour, and two common-sized ears of corn. The hull or covering of the grain is of so many and various colors, that, when ground fine, some of the particles being bolted through with the flour, may have a tendency to darken it some; but as to the color of the flour or bread, few (if any) could discover, from the appearance of either, which was made from the corn, or which from the wheat, when laid by the side of each other.

The bread of the corn, when mixed and prepared for baking in the same manner as wheat flour, will become light sooner than wheat, and in mixing is more difficult; and for pies does not stick together as well as wheat flour. In taste, a difference can be discovered. But let a person who has no knowledge of the article make use of the bread, puddings, or pies, (which occurred at my own table,) and let him be asked of what the article was made, and he would pronounce it wheat, so near does it approach to it. I have said enough by way of recommendation, as it will recommend itself more rapidly than seed can be procured.

The object of my present remarks is more particularly to those who may become possessed of a portion of it to plant, that they may be careful to prevent it from becoming adulterated by mixing. It is not sufficient to plant a portion in the garden, and have a cornfield of other corn near by. It will mix much farther than I could have believed, had I not seen it. In raising what little I have, I planted it the 24th day of sixth month, and gathered it the 10th instant; and my neighbor having a lot of corn near by, I purchased the privilege of topping, or cutting off the tassels, to prevent mixture. I am told, and believe, as much per acre can be raised as of other corn. The stalks frequently have two ears on; and the ears, generally, have as much on as other corn. I have observed almost every color among the grains of this corn, but I have not seen yellow without believing it was a mixture. I have seen some lots that retained all the colors; but I have no doubt of their being much adulterated, from the hardness and shape of the grain, of their compactness on the cob, and their straight rows, which do not often occur in the genuine calico corn. Please retain the two ears of corn and flour at the office of the Cabinet, for inspection. I have omitted to mention that it ought to be gathered as soon as it is ripe, or it will swell, sprout, and damage—particularly if the weather should be wet or damp. I had one and one third bushel of shelled corn, weighing seventy-two or seventy-three pounds when taken to the mill, and had thirty pounds

of superfine, and twenty of common flour, and twenty-one pounds of bran; and several millers agreed in opinion that much improvement in grinding might be made with a little preparation.

Respectfully,

A. W. TOWNSEND.

NEW BRIGHTON, PA., 10*th month* 30*th*, 1843.

No. 2.

Letter of James Stirrat, of Paisley, Scotland.

ON POTATOES.

PAISLEY, *November* 22, 1842.

SIR: The following experiment with potatoes was tried with the view of discovering the cause of so many failures in the crops, of late years, from the seed not vegetating and rotting in the ground. I had an idea that the vegetative principle of the plant might become weak, in consequence of being grown on land that had not been a long time subjected to cropping, and not allowed any length of time to lie at rest. I therefore raised a few bolls on land that had lain lea for 70 years—being part of my bleach green—and found that these, on being planted again the following year, were remarkably strong and healthy, and not a plant gave way; and I have continued the same method for the last six years; and the result has, in every instance, been equally favorable. Four years ago, one boll of my seed potatoes was planted along with some others in a field of about an acre; the other seed was grown on the farm; and the seed all gave way, excepting that got from me. They were all planted at the same time, and in the same manner. From these circumstances, I am of opinion that, if farmers were careful in raising their own seed potatoes from land that has lain long in a state of rest—* or, where that cannot be had, the same object can be obtained by bringing new soil to the surface, by trenching as much as is necessary, or by the use of the subsoil plough—failures from the potato crop, from the seed not being good, would become much less frequent. I am somewhat confirmed in this opinion, by the fact that it has been found for the last dozen of years that, generally, the best seed potatoes have been got from farms in the moors or highlands of the country. The reason of this may be, that these highlands have been but of late brought under crops of any kind, and many of them but newly brought from a state of nature; and the superiority of seed potatoes from these highlands may not at all arise, as is generally supposed, from a change of soil or climate.

Potatoes raised on a new soil, or on ground that has been long lying lea, are not so good for the table as the others, being mostly very soft; and by

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* Mr. Finnie, of Swanstone, informs me that the growing of potatoes intended for seed upon new land, has long been practised by good farmers. Mr. Little, of Carlegill, near Langholm, writes me, that in Dumfriesshire, they obtain the best change of potato seed from mossy land; of oats and barley from the warmer and drier climate of Roxburghshire. The grains, he adds, degenerate by *once sowing*, still looking plump when dry, but having a thicker husk, and weighing two or three pounds less per bushel. The deterioration of seeds in general is a *chemico*-physiological subject of great interest and importance, and will doubtless soon be taken up and investigated.

the following experiment, it would appear that they contain a much less quantity of farina than those which are raised from land that has been some time under crop; and perhaps this is the reason why they are better for seed. From one peck of potatoes grown on land near Paisley, which has been almost constantly under crop for the last 30 years, I obtained nearly 7 lbs. of flour, or starch; and from the other peck, grown on my bleach green, the quantity obtained was under 4 lbs.: from which it would seem, that, as the vegetative principle of the plant is strengthened, the farinaceous principle is weakened, and *vice versa*.

JAMES STIRRAT.

No. 3.

GAMA GRASS.

Ques. 1. In what kind of soil (wet or dry) should it be sown?

Ans. It will grow in any soil, and we have seen a very luxuriant crop in a piece of wet meadow land, where it had been placed from necessity; though its growth was very evidently improved by a thorough draining, to which the land was subsequently subjected. The better the soil, the more luxuriantly will the grass grow. If we were to select a soil for it, we should choose the richest and deepest loam on our place; for, from the great depth to which the roots penetrate, the rapid growth of the plant, and the frequency of its admitting of being cut, it stands to reason that it should have all the advantages of depth and richness of soil, and be unstintingly aided by copious supplies of manure. In the preparation of the soil, care must be taken to provide against weeds; and if it be not naturally calcareous, or have [not] been limed, lime should be supplied, as, like all other grasses and grains, it delights in that soil best where lime abounds.

Ques. 2. When should it be planted?

Ans. As soon in the spring as the land can be got in good tilth. Connected with this part of the subject, we would remark, that after manuring the soil *freely*, it should be ploughed as deep as a strong team can well go; that the ground must then be harrowed until a fine tilth is produced, when it must be rolled.

Ques. 3. How much seed per acre?

Ans. We have never seen the quantity of seed allotted to an acre named; but, from an acquaintance with the size of the seed, should presume that half a bushel would be enough. The customary manner and distance of planting is in rows 18 inches apart—the plants 12 inches asunder—so that it would take 29,046 seed to plant an acre; but as many of the seed do not come up, we think it best to plant the seed much closer in the row—say 4 inches only apart.

Ques. 4. What is the best method of making hay of it?

Ans. Upon this head there is no difficulty whatever, as it is as easily cured as any other grass, and requires no more drying than timothy, orchard grass, or red top. In stacking it away, a peck of salt to the ton of hay would greatly promote its acceptability to the stock.

Ques. 5. Where can the seed be procured?

Ans. We have procured it frequently in Charleston, S. C., where it doubtless

can now be procured; but if our correspondent have half a pint of the seed, and it *be good*, we would advise him to make a beginning with that, as, should they vegetate generally, they will afford him a good crop of seed next year, besides numerous plants for transplantation, as every *bunch* will bear subdividing, so as to allow him from 20 to 50 roots the succeeding spring, which, with the seed, will enable him to set out more than an acre the second year after commencement.

Ques. 6. How often can you cut the hay?

Ans. In Alabama, North and South Carolina, and Mississippi, it has been cut as often as seven times in a season; and we should think that, in Bedford county, Va., from four to five cuttings in a season might be calculated upon, of from 15 to 18 inches in height. But, to ensure this number, every cutting should be followed by a top-dressing of some good, rich, compost manure—as mould, or rotten barn-yard manure, and ashes—say *ten* bushels of either of the two first, to *two* of the latter, to be worked in between the rows with the hoe.

Ques. 7. How much hay will it yield to the acre?

Ans. This is a question that we are not prepared to answer, as our experience is at fault upon this point; but here our good and respected friend (Dr. Magoffin, of Alabama) is a resource to which we can recur with a surety of obtaining the truth. He says that, "at each cutting, a number of the *smallest* branches were weighed, and also of the *largest*. None found less than 5 lbs., and many 15 lbs.; and some 16 or 17 lbs. per plant, at *each* cutting, and *seven* cuttings in the season." He says, also, that he has dried it into hay, at a loss of a little more than one-half in weight, viz: that 14 pounds of grass gave 6 lbs. dried hay. Now, then, if we take the least yield of a bunch or root (that is, 5 lbs.) for our guide, five such cuttings would give us 25 lbs. the season per root of grass; at the rate of the loss named by Dr. Magoffin, it would give an aggregate of 10 lbs. of hay at five cuttings, during the season, for each bunch; so that, as there would be 29,040 bunches on an acre, the acre, at that rate, would yield 290,400 lbs. of hay. But suppose we take the fourth of that quantity as the probable product, and we have 36¼ tons as the yield of the acre; and if we carry the reduction still further, and take the fourth of 36¼, we will still have above 9 tons to the acre. If, however, we take Mr. Magoffin's minimum, of 5 lbs. to the bunch, we get the incredible quantity of 145⅕ tons.

That it is the most productive grass in cultivation, when properly cared for, we have no question; that it is eminently calculated for a warm climate, we are equally certain; and believe, also, that it will be well relished by all kinds of stock, if cut before it becomes too rank. When intended for hay, it should be cut at least once a month—the first cutting to take place when the grass may be 15 inches high. But (as our correspondent, and every other intelligent reader, will admit) to get the most out of this grass, it must be grown under the most favorable circumstances of situation, soil, preparation of soil, cleanliness of culture, and heavy manuring. The soil in which it may be grown should have lime in it; be heavily manured before ploughing; be moderately top-dressed after every cutting; the weeds must be kept down by hand and hoe weeding; and the ground be kept open to the influence of the elements.

The seed, in the outside covering, are somewhat the shape of castor-oil beans, though much smaller, of a dusky-yellow color.

In preparing them for planting, they should have four times their quantity of hot water poured over them, and be permitted to remain therein for 48 hours, when they may be planted in a bed, in rows 18 inches apart; the seed to be drilled at 12 inches asunder. When they first come up, they look like corn. They must be kept clean of weeds and other intruders, by hoeing and hand weeding, the first season.

It may be said to be a matter of great labor to set a meadow with Gama seed; and so it is. But, when one reflects that, when once set, it will last 70 years, and that one acre will give as much hay as *ten* set in any other grass, the *trouble*, *labor*, and *cost*, should not be permitted to preponderate against the manifold advantages which belong to its culture.

Now, what would be the labor attending the setting of an acre, the plants being grown? Not much more than planting an acre in corn. With two boys ten years old, with the plants in baskets, to drop them in the furrows 12 inches apart, and two men to cover with the hoe, and press the earth with its back, we would agree to plant out an acre in a day.

Notwithstanding the immense yield of this grass; notwithstanding its long continuance; notwithstanding it is nutritive to, and relished by, stock of all kinds—such is the aversion of the great body of agriculturists to incurring *extra* labor, that we fear it will never be successfully introduced.

So far as our personal knowledge of this grass extends, we think that it delights in a warm climate; and that probably it could not be cultivated to advantage in the northern and eastern States. To the southern States, we look upon it as a God-send; as it would, if its culture were generally attended to, enable their planters to amply supply themselves not only with grass for soiling their stock through the summer, but with abundance of good provender for winter.

Culture of Gama grass.

I feel much gratified by your excellent remarks on the subject of the gama grass, in your valuable periodical of the 19th April last. A practical knowledge of this plant for the last twenty years, and having given the first impulse to public attention towards it, in the south and east, I feel more than usual interest in it—especially as this acquaintance and experience compel a belief *that it is yet the most valuable grass for animals*, and for the interests of the cultivator of the soil, *considered in every point of view*, (wherever the locality is found favorable,) that is yet known. From the nature of the remarks that I have read regarding it, it is evidently ranked by some gentlemen amongst the coarse grasses. On this part of the subject I must remark, that the degree of coarseness depends on the mode of cultivation, and the *stage* at which it is cut and used. At fifteen days' growth, I must contend that it is among the most delicate known, more nearly resembling the blue grass than any other.

Taking your judicious replies to the queries proposed, as they stand: to the first I beg leave respectfully to add, that my first and so highly successful essay to cultivate this grass was on *fine*, sandy land, with a red clay foundation, dark gray surface about six inches; although some of the finest specimens that I have ever seen are found in the low grounds of the Tombigbee, and the black rich limestone prairie lands of the Choctaw nation, in about $32\frac{1}{2}°$. Another splendid growth (say many acres in a body) is found

in a state of nature, twelve or fifteen miles east of the Tombigbee, on the rotten limestone land bordering a small creek.

2d query. For a perfect cultivation of this grass, *trench*-plough as deep as possible previous to setting a piece of ground with this grass; let the largest bar-share be followed by a proportionably large scooter, or bull-tongue plough; and, if possible, cross the land in the same way; recollecting this extra work is only once during a lifetime. Pay no attention to the foundation of your soil, but loosen deep. To prepare other land in the way to produce the most lasting and successful growth, I spread, previous to the first ploughing, a heavy coat of manure. I admit the cultivation will cause the manure to *sink*, but not half as *deep* as the *roots* will penetrate. At the second preparatory ploughing I lime, if the soil is any other than rotten limestone land, or prairie; I prefer entirely raising the plants on a bed, and setting the land, as in the case of tobacco plants, and set them fifteen inches apart, every way. Here it must be recollected that the disposition of this plant to spread its roots, as well as to go down perpendicularly, is such, that, at even two feet from plant to plant, the cultivator cannot calculate on giving his field of it more than one ploughing, or two at most, the first and second year after setting out the plants—and, indeed, during his life. This can be done safely the first and second years, by running a bull-tongue with a small mule, guided by a careful ploughman, between the rows, each way twice in the same track. All after-cultivation must be with the *pronged hoe.* With this tool well-made, a skillful hand will clean and loosen the ground at every hoeing nine to twelve inches.

Query 3d. Fully answered.

Query 4th. Cut it with a sickle or scythe; what you cut, scatter as fast as cut, before 12 o'clock. If the weather is *clear*, turn over next morning after the dew is off the grass, and stack after 12 o'clock, sprinkling salt liberally whilst stacking, for hay cut every thirty days. Not a grain of the salt used will be lost.

5th. After gathering the seed, throw them into a vessel, mixing with them any moderately moist sandy soil—keeping the vessel in a cool and rather damp place until planting time.

6th. If perfectly cultivated for hay, this grass must be cut every thirty days; or, if for soiling horses, cattle, or mules, the same age is proper from the 1st of May to the 1st of November, in latitude 31° to 33°. For a milch cow, to produce the finest of milk and butter, cut every fifteen days; it will then be found 24 to 30 inches in height; if cut monthly, from 36 to 42 inches high. After the first cutting, leave a few rows for seeding.

7th. Of *green* grass—the product cultivated, as heretofore stated, will be found from 150,000 to 250,000 pounds per acre per annum. At each cutting, loosen the ground between the rows with the hoes before mentioned; and, to procure the greatest possible product, scatter manure after the *second* cutting. The relative value of this grass I was *compelled* to test. I cut it with a sickle; bound it into small sheaves on the fore part of the day, after the dew was off, at thirty days' growth. With one of Mr. Eastman's cutting-boxes, I cut it up—say an inch in length; this was done for feeding in the after part of the day, and cut at dinner-time, while the animals were eating, for night feeding. I gave each mule as much of the cut grass as he could eat, together with a tin-cup full of Indian rye and pea meal strewn over it, with salt proportioned.

My oxen engaged in hauling, I fed in the same way. I never had more or better work done, or healthier animals. The cutting of the grass, in a

lot adjacent to the stable, was done during the time the animals were allowed for eating, nooning, &c.—no time lost.

In feeding with this, or any other green grass, I add a small quantity of rye, oats, barley, or rice, cut on the sheaves, and mixed with the grass.

No. 4.

TUSSAC GRASS.

There is another indigenous grass of inestimable value, which deserves the particular attention of every person connected with grazing and sheep-farming even in England, but more especially Scotland and Ireland. I allude to what is here called "*tussac*." The tussac is a gigantic, sedgy grass, of the genus *carex*. I measured the length of the blades, and found them to average seven feet in length, and three-quarters of an inch in width; some, in favorable situations, are longer, and, if cultivated with care, they would flourish still more vigorously. The plants grow in bunches close together, and as many as 250 roots spring from one bunch. In old plants, the decayed roots of successive shoots form a cushion of dry entangled fibres, which raise the bunch from the ground. This cushion sometimes attains to a great size and height, so that a person standing in a patch of old tussac may be quite sheltered and concealed. The cushion is dry and inflammable; and where the wild cattle and horses have completely destroyed the plants by eating down to the very roots inclusive, these lumpy accumulations of decayed fibres are left, encumbering the ground with a multitude of hummocks—easily removed, however, by fire.

The grass, growing in large tufts upon the high base of decayed roots, resembles, at a distance, a diminutive grove of thickly-clustered palms; and, from the dark green and luxuriant appearance given to the smaller islands clothed with tussac, the richness of tropical vegetation is forcibly recalled to the memory.

All other species of the genus *carex* are described in botanical works as coarse and rank, and by no means adapted for fodder; but it is very different indeed with this species. That it is sweet flavored, tender, and most nourishing, is evident from the avidity with which all animals feed, and the rapidity with which they fatten upon it—cattle, horses, sheep, and pigs alike. For about three or four inches, the roots are very agreeable to man, being crisp, and of a sweetish, nutty flavor, very much resembling the heart of the palm-tree in the West Indies, which is called the mountain cabbage.

There is an island close to the settlement, which is fringed with the tussac grass for a breadth of about 200 to 300 yards, the remaining portion being wiry, coarse grass, and moss, on wet land. Lean cattle turned upon this island become fat in two or three months; and the miserable old horses that return from the cattle-hunting expeditions dreadfully out of condition, soon pick up, and become quite fat upon the tussac which grows there.

The two Americans who wandered upon West Falkland for fourteen months, lived upon the root daily, and formed their huts of what I have termed the cushion, rolling one to the small doorway or opening when night came on.

The long blades of the grass make but an indifferent thatch, as it is too

brittle to last when dry; there are no fibres sufficiently tough or coarse for this purpose. I may notice that cattle and horses will readily eat dry tussac when they cannot procure it fresh; but an ample supply of it can always be obtained, as it is green and luxuriant all the year round.

The bounty of Providence causes this extremely nutritious grass to grow most luxuriantly in the rank peat-bogs by the seashore, where any other, even of the most inferior quality, could scarcely live. I may say that, by far the greater part of the coasts of these islands are fringed with it—in many places to the breadth of half a mile; all the smaller islands are completely covered with it. It grows readily between clefts in the rocks, out of shingle and sand, close down to high water mark; but it is most luxuriant where there is a depth of wet, peaty bog. Whether it will grow upon boggy land further than half a mile from the sea, can only be determined by experiment. At the proper time I shall try it, and I entertain the most sanguine hopes that it will succeed; though, perhaps, it may not grow so luxuriantly as by the seashore.

If it should succeed upon inland bogs, such land could be made to yield as much nutriment for cattle as any other.

Some seeds of the tussac grass, sown in the Government garden, in good soil, different from that in which it grows naturally, and at a little distance from the sea, have shot up, and are likely to prove that this valuable fodder for cattle may be cultivated in any soil; but it evidently prefers moisture, and would probably require irrigation in a dry soil at any distance from the sea.

During several long rides into the country, I always, as I have before stated, found the tussac flourishing most vigorously on spots most exposed to the sea, and in soil unfit for anything else to live in, viz: the rankest peat-bog, black or red. It is singular to observe the beaten footpaths of the wild cattle and horses, as marked as a footpath across the fields in England, extending for miles over wild moorland, and always terminating in some point or peninsula covered with this favorite fodder; and amidst which it is almost certain to meet with solitary old bulls, or perhaps a herd, or a troop of wild horses just trotting off, as they scent it from a great distance.

To cultivate the tussac, I would recommend that the seed be sown in patches just below the surface of the ground, and at distances of about two feet apart, and afterwards weeded out, as it grows very luxuriantly, and to the height of six or seven feet. It should not be grazed, but reaped or cut in bundles. If cut, it quickly shoots up, but is injured by grazing—particularly by pigs, which tear it up to get at the sweet, nutty root. I do not know how it would be relished as hay, but cattle will eat the dry thatch off the roof of a house in winter. Their fondness for this food is so great, that they will scent it at a great distance, and use every endeavor to get at it. Some bundles, which were stacked in the yard at the back of the Government house, were quickly found out, and the cattle from the village made repeated endeavors every night to get at them; giving much trouble to the sentry on duty to drive them away.

ARUNDO GRASS.

Extract from a report of Mr. Hooker, September 5, 1842.

Another grass, however, far more abundant, and universally distributed

over the whole country, scarcely yields in its nutritious qualities to the tussac; I mean the *arundo alopecurus*, which covers every peat-bog with a dense and rich clothing of green in summer, and a pale-yellow good hay in the winter season. This hay, though formed by nature without being mown and dried, keeps those cattle which have not access to the former grass in excellent condition, as the beef which our parties for the four winter months supplied the ships with can abundantly testify.

Letter of Mr. Pell, on the culture of grass.

PELHAM, ULSTER COUNTY, *January* 21, 1844.

SIR: When preparing a meadow on upland, I usually seed on wheat, sowing in the fall half a bushel of timothy seed to the acre, which is limed at the rate of 300 bushels; and the following spring, after a moderate fall of snow, one bushel of clover seed, top-dressed with charcoal dust, and rolled. From land so treated, I cut last season three tons of hay to the acre. My practice is to commence cutting when one-third of the blossoms of clover have turned brown, and the timothy just parting with its bloom.

The grass thus cut is drawn immediately into the barn, and one bushel of fine salt spread by hand thinly over each alternate layer, composing a ton, as stowed away in the mow. The salt prevents mow-burning, moulding, &c., and the stock are induced to eat it as greedily as they would new-mown grass, which it nearly resembles, as its most nutritious juices are preserved, being diffused through the stem of the entire plant at that period of its growth. If left on the ground until the seed ripens, the saccharine juice of the plant is lost.

The principal desire of the farmer should be to preserve the green appearance of his hay, and at the same time make it tender and palatable to his stock. The fermentation which ensues after it is housed, secures that object, and prevents the inevitable injury to his meadows which follows ripening grasses. By early harvesting he obtains a luxuriant growth of aftermath or rowen, almost as nutritious as the first, and as much relished by cattle, but peculiarly adapted to sheep.

It is now supposed by chemists that the plan of keeping a large stock of horned cattle for the express purpose of manuring a farm, is an erroneous one on this account. The ashes of all grasses contain, by analysis, in greater or less proportion according to the varieties, *potash*, *soda*, *lime*, *magnesia*, *alumina*, *oxide of iron*, *oxide of manganese*, *silica*, *sulphuric acid*, *phosphoric acid*, and *chlorine;* many of which substances are required in the animal economy to form muscle, blood, horns, hoofs, &c., and are forever lost to the farmer.

If instead, therefore, of keeping stock for that purpose, he were to convert his straw, chaff, and refuse hay into manure, in a compost heap, by means of lime, lye, charcoal dust, &c., would he not save, without the least loss, every requisite for the ensuing crop?

Yours, respectfully,

R. L. PELL.

No. 5.

WATER-ROTTING HEMP.

The subject of hemp, in all its management, is one of decided interest throughout the west. At present, Russia furnishes most of the hemp for our navy; not because it grows more luxuriantly, or that the fibre is better than the growth of this country, but because it is better prepared for manufacturing than in this country. It is to the interest of the farmer, manufacturer, and the nation, that we produce at least enough for our own consumption; and what we lack is mainly in the mode of rotting and cleaning. It is decided, by universal experience, that water-rotted hemp is better for perhaps every purpose than dew-rotted. The communication from the pen of the Hon. H. Clay, here annexed, contains most valuable information; and we ask our many readers to give it a careful perusal, and endeavor to put themselves in possession of the advantages afforded:

Ashland, *May* 28, 1843.

Dear Sir: I received your letter, requesting information as to my method of preparing my water-rotted hemp for market. I water-rotted, last winter and this spring, eight or ten tons, in vats 50 feet long, 12 wide at the bottom and 14 at the top, and $4\frac{1}{2}$ feet deep. The hemp is first put in the vats carefully, the water then introduced, and when the hemp is sufficiently rotted the water is let off. It is very buoyant, and requires great pressure to keep it immersed in the water. I did not succeed well at first, and am not now entirely satisfied with my contrivance. Weights of logs or stones, or both, will answer; but are inconvenient to remove. I think the best plan will be to sink posts at the distance of six or eight feet apart on each side of the vats, but alongside of them. At the bottom let there be hooks in the posts, on which should be laid a log or beam, and then cover them up with earth to the top of the vats. At the top of the posts let there be also hooks, to receive logs passing across the vats from one post to the opposite post. I know that this arrangement, if properly executed, will keep the hemp down in the water.

The length of time of the immersion of the hemp depends upon the temperature of the water; it will remain in cold water six or seven weeks; whilst in very warm weather six or seven days, or less, will be sufficient. You can only determine when the hemp is sufficiently rotted by experiment—taking out a handful, and, when dry, applying it to the brake; but you will soon learn to decide on that point.

When the hemp is rotted enough, it should be spread on the ground to dry—or, which is better, on short grass. If it be not sufficiently rotted, the process may be completed by the rain and dew, without injury. After it is rotted sufficiently, it is broken out in the same old method that has long been practised with dew-rotted hemp. There are now in progress in my neighborhood various experiments to save labor, by breaking out hemp with horse power; some of which, I think, will succeed.

I am not yet able to inform you of the best mode of handling and preparing the article for market. I have just sent (for the first time) three or four tons to the eastern market, as specimens; and I shall know what is the best method when I hear how they are received. I had the hemp put in bales of two or three hundredweight, pressed by a powerful screw, and

covered and tied up with cotton bagging. One parcel was hackled so much as to take off one-fourth in tow, but this tow is not lost; the other parcel I sent off as it came from the brake, clean, and divested of showers.

I intend to engage more extensively this year in water-rotting my crop, and I am very sanguine of success. American hemp, as prepared, is undoubtedly as good as Russia hemp.

Wishing you great success in your enterprise, I am, respectfully, your obedient servant,

H. CLAY.

BERNARD MYERS, Esq.

No. 6.

RICE.

Description of a few varieties of rice cultivated at the Philippine islands. The varieties are very numerous; the natives distinguish them by the size and shape of the grain.

Binambang.—Leaves slightly hairy; glumes whitish; grows to the height of about five feet; flowers in December: aquatic.

Lamuyo greatly resembles the above; is more extensively cultivated, particularly in Batangas, where it forms the principal article of food of the inhabitants of the coast: aquatic.

Malagcquit.—This variety derives its name from its being very glutinous after boiling; it is much used by the natives in making sweet or fancy dishes; it is also used in making a whitewash, mixed with lime, which is remarkable for its brilliancy, and for withstanding rain, &c.: aquatic.

Bontot Cabayo.—Common in Ilocos, where it is cultivated both upland and lowland; it produces a large grain, and is therefore much esteemed, but has rather a rough taste.

Dumali, or early rice.—This rice is raised in the uplands exclusively, and derives its name from ripening its grain three months from planting; the seed is rather broader and shorter than the other varieties; it is not extensively cultivated, as birds and insects are very destructive to it.

Quinanda, with smooth leaves. This variety is held in great estimation by the people of Batangas, as they say it swells more in boiling than any other variety; it is sown in May, and gathered in October: upland.

Bolohan.—This variety has very hairy glumes; it is not held in much esteem by the natives, but is cultivated on account of its not being so liable to the attacks of insects and diseases as most of the other upland varieties.

Malagcquit.—Smooth leaves; glumes red, (all the preceding are whitish;) possesses all the qualities of the aquatic variety of the same name—that of being very glutinous after boiling. This rice is said to be a remedy for worms in horses, soaked in water, with the hulls on; it is given with honey and water.

Tangi.—Leaves slightly hairy; glumes light violet color. This upland variety is held in much esteem for its fine flavor.

No. 7.

MAPLE SUGAR.

To the Committee on Maple Sugar of the New York State Agricultural Society.

Gentlemen: I herewith submit to your inspection 50 lbs. of my maple sugar. The following is a statement of the manner of making and clarifying the same:

In the first place, I make my buckets, tubs, and kettles all perfectly clean. I boil the sap in a potash kettle, set in an arch in such a manner that the edge of the kettle is defended all around from the fire. I boil through the day, taking care not to have anything in the kettle that will give color to the sap, and to keep it well skimmed. At night I leave fire enough under the kettle to boil the sap nearly or quite to sirup by the next morning. I then take it out of the kettle, and strain it through a flannel cloth into a tub, if it is sweet enough; if not, I put it in a caldron kettle, which I have hung on a pole in such a manner that I can swing it on and off the fire at pleasure, and boil it till it is sweet enough, and then strain it into the tub, and let it stand till the next morning. I then take it and the sirup in the kettle, and put it all together into the caldron, and sugar it off. I use, to clarify say 100 lbs. of sugar, the whites of five or six eggs, well beaten, about one quart of new milk, and a spoonful of sal eratus, all well mixed with the sirup before it is scalding hot. I then make a moderate fire directly under the caldron, until the scum is all raised; then skim it off clean, taking care not to let it boil so as to rise in the kettle before I have done skimming it. I then sugar it off, leaving it so damp that it will drain a little. I let it remain in the kettle until it is well granulated. I then put it into boxes made smallest at the bottom, that will hold from 50 to 70 lbs., having a thin piece of board fitted in two or three inches above the bottom, which is bored full of small holes to let the molasses drain through, which I keep drawn off by a tap through the bottom. I put on the top of the sugar, in the box, a clean damp cloth; and over that, a board well fitted in so as to exclude the air from the sugar. After it has done or nearly dcne draining, I dissolve it, and sugar it off again; going through with the same process, in clarifying and draining, as before.

I do certify that the above is a correct statement of my mode of making maple sugar.

JOEL WOODWORTH.

No. 8.

For the Indiana Statesman.

Experiments in sugar making from the stalks of corn.

Mr. Editor: As many of your readers may not have had the opportunity of seeing the accounts regarding the making of sugar from the juice of the cornstalk, and as it is entirely a new business, it is perhaps well for all to publish what they have done; then the practice of each may thus be corrected by the experience of the whole. I am the more induced to do

this, as I have this year succeeded beyond my most sanguine expectations, considering that I had, single-handed and alone, to do all that was necessary to a new and untried experiment. I send you, herewith, samples of the sugar and molasses. You will perceive there is more acid in them, than is usual in those of the sugar cane; the reason for which I shall probably give you hereafter. In consequence of my corn being twice prostrated to the ground by two storms in the month of July, it was not more than one fourth of a crop, and that the smallest of the stalks, as the large ones, after the second prostration, never rose again, but lay and took root, and were trampled on and destroyed in the subsequent operation of frequent passing through to pull off the ears. Those which were left standing, from their being so thin on the ground, and a generally moist season, were so constantly disposed to throw out ears, that I am inclined to believe they were not so rich in saccharine matter as if they had been placed under more favorable circumstances. I shall therefore not attempt, from this year's crop, to give any opinion as to the quantity of sugar per acre. From a small experiment made last year, I am inclined to believe it will be over 500 lbs. of sugar and molasses. As I believe this to be a very important subject to farmers, I will give a detailed statement of the process, from the planting of the corn to the graining of the sugar. The ground is first to be prepared in the usual way for growing corn. The corn to be planted in drills thick enough to leave the stalks from three to four inches apart; the rows about three feet apart, or a sufficient distance to allow the plough or cultivator to pass between. It must then be cultivated and kept clean, as corn usually is. As soon as the ears begin to form, or about the time they show silk, they must be pulled or cut off, (let us never forget that to Mr. W. Webb, of Wilmington, Delaware, is owing this discovery;) this must be attended to from day to day, as long as it shows a disposition to form ears. Perhaps this may be the most conveniently done by the hooked knife used to strip off the blades.

I believe it may be planted, in our climate, any time from the 15th of April to the last of June; and it will be ripe, accordingly, from about the 15th of August to the last of September. When the blades begin to die about the middle of the stalk, I should think it was high time it was cut and pressed out; but as I have but little experience in the business, I don't know but it would be better to begin earlier. When ripe, the blades must be stripped off. For this purpose I have found great facility in a hooked knife; the hook about four or five inches, semicircular, straight below about two or three inches, with a tang to drive into a wooden handle about twelve or fifteen inches long. I found this knife materially reduced what I otherwise found a very tedious operation. By reaching up as high as you think the stalk is large enough to contain any juice, and bringing the knife close to the stalk down to the ground, you will strip off all the blades on one side; by doing the same on the other side, you will generally complete the operation. The same knife will easily cut the stalk at the ground; and while it is in your hand, one blow will cut off the top. It is then to be thrown in rows, to be carted to the mill, and the tops and blades may be secured for fodder. It would be well not to cut more in one day than can be pressed on that day and the next; and that cut should be placed in the shade as speedily as possible. My mill is three wooden rollers (of beech) fixed upright in a frame, similar to an apple mill; the centre roller has a shaft run up through a frame, a sufficient height for the lever that the horse turns it

by, to clear a person's head—say seven feet from the ground. The centre roller has cogs in it, working in holes in the two side rollers, (though I should think it would be better to have cogs in all the rollers.) The rollers are fourteen and a half inches in diameter, sixteen inches below the cogs, four inches cogs, and six inches above. The journals of all the rollers are six inches in diameter; the two outside rollers have boxes let into the frame, and made to fit up against the journals above and below, and are wedged by two wedges, each going through the mortises in the frame, so as to set up the two outside rollers against the centre one. On the back side of the left-hand roller is a scraper fastened to a piece of wood, and attached by two hickory springs to the upright piece of the frame; (my scraper is a piece of saw-blade; a piece of hoop-iron will answer;) it should be sufficiently wide to extend beyond the piece of wood to which it is attached, to admit the shell to lie on the back of it; this scraper should be so adjusted as to lie sloping against the roller, and spring off and on with its movement. On the back of the middle roller is a shell of a circle, one inch larger in diameter than the roller, and kept about that distance from it; and on the outside of the scraper, and pressed up against the piece of wood that the scraper is attached to: it is fastened to the frame in such a way as to be moved off and on, at pleasure. I am thus particular in describing this, because I had considerable difficulty in getting it to work well. When the arrangement described was completed, the stalks passed through without any difficulty. A trough or box is fixed underneath, so as to catch the whole of the juice wherever it may fall, which conveys it to a tub or bucket to be carried to the boilers. The horse goes to the left; the stalks are pressed in (about four at a time) between the right hand and middle rollers; the scraper forces them off the right hand roller, the shell confines them to the back of the middle roller, and by it they are carried round, and are drawn in between the middle and left hand roller; and after receiving a double pressure, come out on the front side where they went in. With this mill, one person and one horse will press out about two barrels per day.

The next operation is the boiling. The arrangement must be such as to boil down the juice as rapidly as possible; granulation depends on the rapidity of boiling, and it need not be expected without it. Cane juice is boiled down in about three-quarters of an hour; I boiled down in about two hours, more or less. I have three iron kettles from eight to ten gallons each, fixed in a brick arch—one kettle only immediately over the fire; the blaze and heat pass under the other two, through flues four inches deep; the bottoms of the kettles only are exposed to the fire. The juice is first passed through a sieve, to take out the coarser impurities; lime-water is then added, in proportion of a table-spoonful to a gallon. I think it probable this is not enough; experience can only inform us as to the proper quantity. Much, perhaps, depends on the state of the juice in regard to acidity. It is then put in the kettle farthest from the fire; and care must be taken that it is well skimmed before it comes to a boil; it is then passed to the next kettle, and fresh juice put in the first; it is next passed to the last kettle over the fire, where it is finished as rapidly as possible—any portion of scum to be removed at all times whenever it may appear. To those totally unacquainted with the business, the most difficult part is to ascertain when the boiling is carried to the point of granulation. Those who are accustomed to the boiling of maple juice will, perhaps, have no difficulty; but for those who are not, I will give the little knowledge I possess. The

granulating point is when it will raise Fahrenheit's thermometer to between 238 and 240 degrees; but as all do not possess a thermometer, we must depend on other indications. When it is raised to about 218 degrees, it begins to rise up, and would flow over the top of the kettle if small portions were not taken out with a ladle from time to time, and poured back again. This continues till the heat is raised to 225 or 226, when it begins to thicken, settles down in the kettle, and shows no more inclination to rise up. But the heat has still to be raised between 12 and 14 degrees before it is finished; the indications of which are—a smell of burnt sugar, bubbles burst with difficulty, and, as they do so, puffs of steam rush out; and if, by taking a small portion between the thumb and finger when moderately cool, it will draw a thread more than half an inch long, it is considered to be finished. From information which I have obtained from those acquainted with the boiling of cane juice, the sirup begins to grain immediately after being taken from the kettles. I endeavored to heat mine in the same way, as near as circumstances would permit, but the graining did not commence in less than from twelve to forty-eight hours; perhaps something depends on the quantity. The sirup, after it became cool, was poured into a common sugar or flour barrel, where the whole grained, and the molasses flowed out through small holes in the bottom; and the result is such as the sample sent. The sugar, I believe, would be like any other coarse brown sugar, if the molasses were thoroughly drained out. The molasses is a little more acid than cane molasses usually is. This arises, perhaps, from the stalks being a little too old; or, perhaps, from not using lime-water enough: experience will most likely correct this. From want of time and conveniences, I made no experiments in the way of measuring or weighing, to ascertain the proportion between the juice and sirup, or the molasses and sugar. From experiments made last year, at several different times twenty moderately well grown stalks yielded a gallon of juice. One gallon of juice will probably yield from a tenth to an eighth of sirup; one pint of sirup weighs one pound and a half, and will yield by measure, perhaps, one fourth molasses and three-fourths sugar. My stalks were, in all cases, raised on upland, and cannot be expected to be as large, or yield as much juice, as the rich bottoms of the Wabash would produce.

JOHN BEAL.

New Harmony, *October* 20, 1843.

No. 9.

Letter of J. T. Plummer.

Richmond, 12*th month* 12*th*, 1843.

In compliance with thy request to be informed of my success in sugar making from the cornstalk, I may say, so far, it is an entire failure. In every other respect, it met my most sanguine expectations. My mill performed admirably; the juice was abundant and rich; it boiled down to a fair molasses in a short time, and continues in that state up to the present time. I carried out Professor Mapes's directions as far as practicable, but could never get the thermometer to rise higher than 226, and at this number the molasses was brought down to be as thick as *mush*: this failed to grain.

I then tried W. Webb's plan, and have failed in that also. I then tried my own common sense, as I make the tree sugar; and in this I have failed. May I hope to be favored with a copy of thy valuable report to Congress? Perhaps it may give some directions how to bring molasses to grain. It is, doubtless, one of the most valuable discoveries of modern time, if it can be brought to sugar down; and I see no reason why it cannot, for the molasses is as pure, and of as beautiful a straw color, as any tree molasses we ever made. There is some simple chemical operation wanting, that we are yet ignorant of. Has Professor Mapes tried the experiments he promised, and did he succeed? Any information thee can furnish me with, will be thankfully received, and, if opportunity ever offers, be assured, shall be reciprocated by thy friend,

JOSEPH T. PLUMMER.

H. L. Ellsworth.

No. 10.

CORNSTALK SUGAR AND MOLASSES.

To the editors of the Tennessee State Agriculturist:

In compliance with a request set forth in the last No. of the Agriculturist, I now furnish you with such information as I possess on the subject of making sugar and molasses from the common cornstalk, which, if you deem of sufficient importance, you may publish in your valuable journal.

Respectfully, your obedient servant,
WILLIAM H. DEADERICK.

Having, during these hard times, felt somewhat restive under a heavy tax imposed by the necessity of providing sugar for the daily consumption of a large family, and stimulated by the essay of Mr. Webb on the subject of manufacturing sugar from cornstalks, I determined, last summer, to give the project as fair trial as my entire inexperience in the business would permit. Accordingly, the construction of a small mill, with two rollers about 15 inches in diameter, was procured; and the first effort made with stalks from which the corn had been taken for the purpose of cooking. The juice, after standing half an hour to settle, was deposited in a bell metal kettle to boil; and, when hot, a table spoonfull of lime-water was added for each gallon of juice. Before it became too thick for the purpose, it was again strained, and carefully skimmed during the whole process of the boiling. When boiled down to the point of crystalization, (which is indicated when a portion, taken whilst warm between the thumb and forefinger, can be drawn into a thread from a half to an inch in length,) it was removed from the fire, and a small quantity set aside for granulation. In about three days this process commenced, and after perhaps one-sixth part had crystalized, it ceased, and would proceed no further. The next trial was from stalks, the corn on which had just become too hard for table use. In like manner portions were set aside, and the next day granulation commenced, and twice as much underwent this process as in the first instance. The third essay was with stalks, the corn on which had nearly become hard enough for grinding. The sirup or molasses obtained from these was greatly inferior to the two first, and, although a part of it was kept several

months, never evinced any tendency to crystalize. It would thus appear that the age of the stalk most congenial to the granulating process is when the corn is just becoming too hard for the purpose of cooking. However, it will require further experience, positively to determine this question. The sirup thus procured was somewhat darker than honey, but perfectly transparent, and free from impurity, and pronounced superior, without exception, by numerous persons who partook of it, to either imported molasses or honey. It presented no other taste than that of a rich and luscious sweet, wholly free from any strong or unpleasant flavor, such as appertains to the articles just named. The sugar obtained did not, either in appearance or taste, differ more from Orleans sugar, than different lots of this article do from each other. The indisposition of the sirup to granulate fully, may perhaps be deemed discouraging; but, doubtless, future experience will develop some method to obviate this difficulty. Nevertheless, be that matter as it may, it will now be shown that this objection is not sufficiently formidable to prevent the substitution even of the cornstalk sirup for Louisiana sugar and molasses. Sundry visiters, at various times, to the family of the writer, partook of their coffee clandestinely sweetened with this sirup, and, on being apprized of the deception, acknowledged that they did not perceive or suspect that it was sweetened with any other article than the one in common use for this purpose.

It is fair, however, to say, that when the attention was directed to the case, the coffee could be perceived to have a slightly acidulous taste, just as if the cream used in it was beginning to turn sour. This trivial peculiarity, however, of the sirup, was not considered objectionable by any person. The preferable and most convenient mode, however, is to add the sirup (about a table spoonfull for each individual who may be expected to partake) to the coffee, when first made, and boil it all together. The taste of the coffee managed in this way, cannot be distinguished from that sweetened with the best Orleans sugar. Suffice it to say that the sirup, for more than a month, was used in the writer's family, as a substitute for sugar, with entire satisfaction. It was tried in making preserves, which, I believe, were just as good as if made with brown sugar. Sweet-cakes were made at the same time with both articles, and no one could tell which were of the sugar, and which of the molasses. But be it remembered that, in order to realize these, the article must be *carefully made* in the way indicated above.

One hundred large cornstalks will afford ten or eleven gallons of juice, which, when boiled down to the point of crystalization, will yield one gallon of sirup. One acre of ground drilled with corn one foot apart, in rows three feet asunder, will give about 14,000 stalks. Of course those (at 100 stalks per gallon) would yield 140 gallons of sirup, suitable for any of the purposes for which brown sugar is used. If intended for molasses, it need not be boiled down so thick, and will, probably, make 160 or 170 gallons.

Of sugar it requires 3 drachms ($\frac{3}{8}$ oz.) by weight to sweeten an ordinary sized cup of coffee. Of the sirup it requires, also, three drachms by measure to do the same. Now, as there are just as many drachms in a pint as there are in a pound, it follows that a pint of the sirup is equal to one pound of sugar, or one gallon to eight pounds. Of course, then, the 140 gallons of sirup, the produce of an acre of land, are equivalent to 1,120 lbs. of sugar. The whole business of gathering, stripping, and grinding the stalks, can be performed by boys from 7 or 8 to 12 or 13 years of age.

The experiments recited above assuredly justify the following conclusions, to wit: Any individual possessing only a small portion of land can, with a little labor, and no expense after the mill is once erected, supply his family with sugar and molasses. No real necessity exists for Tennessee, or any other corn-growing country, to import a single hogshead of sugar, or barrel of molasses; inasmuch as the first equal, and the second superior to the corresponding articles of Louisiana production, can be obtained from the cornstalk, with half the labor required to produce them from the sugar-cane. Against the next season I design to have constructed a more efficient mill, with three rollers, say 20 inches in diameter; and shall thenceforward consider myself released from the expenditure complained of in the commencement of this article.

D.

No. 11.

CORNSTALK SUGAR.

The following is an extract from the report of the committee on maple and cornstalk sugar, at the New York State agricultural fair:

The committee have great pleasure in stating that Mr. M. Adams, of Ogden, in Monroe county, has gone into the experiment of manufacturing sugar of cornstalks; and for one acre of the "eight rowed yellow northern corn," he has constructed an iron mill for crushing the stalk and expressing the juice, which answers the purpose admirably; but it is yet too early in the season to know the result of the experiment, as a part only of the cornstalks have been gathered and manufactured, and the remainder are yet standing in the field.

Mr. Adams has, however, already made about 400 weight of sugar, a sample of which he has submitted to your committee, and which, though not yet clarified, appears to be of a fair quality, capable of equalling the best of sugar made from the cane. The stalks still on the ground he thinks will make 400 weight more sugar; but had it not been for the excessive drought which has prevailed in that section of the country, he is satisfied that the acre planted and experimented upon by him would have produced 1,000 weight of sugar, which was the rate yielded by two rods of the land which he measured off, the proceeds of which he worked up by itself.

Upon the whole, Mr. Adams is perfectly satisfied that sugar can be made in this part of the country, from cornstalks, of superior quality and flavor, and equal, in every respect, to the best sugar made from the cane, *and so as to remunerate well for its manufacture.* He proposes, at the next meeting of the society, to present a full report of his present experiment; and your committee have great confidence that it will be of such a nature as not only to entitle Mr. Adams to the premium offered by the society, but to the praise of being the first to carry into actual operation an experiment that has been anticipated as the source of great wealth and benefit to the agricultural interests.

JOHN GREIG,
ROSWELL RANDAL,
A. B. DUNLAP,
Committee.

No. 12.

Adams Basin, *December* 26, 1843.

Dear Sir: Yours of the 19th instant was received this day. I hasten to comply with your request for information as to the "successful experiment" which you learn I have made in the manufacture of cornstalk sugar. I regret to inform you that my success has not been so great as was at one time anticipated. I engaged in the experiment with very sanguine expectations. They have, in every respect, been realized, except in the graining; in this, to some extent, I have been unsuccessful. A part of my sirup, I am satisfied, never will grain. It was not properly cleansed from mucillage, and fermentation was the consequence. I now think that the great difficulty with my good sirup is, that it has been kept too cold. Two small parcels, left (partly by accident) where they received the warmth of a fire, were found very well grained. The first batches that I made appeared as if they would grain well; from one of them was taken what was called a very fair sample of sugar, and exhibited at the great fair at Rochester. The high expectations formed by the committee and myself, at that time, have not been fully realized. But a part of my crop was then cut. The weather was then warm and fine; but it soon came on cool, the granulation ceased, and from that time has remained stationary. Not knowing what to do, is one reason (but a principal one is two months' confinement by sickness) why I have not made some experiments upon it. With my now returning health, I hope yet to produce a good article of sugar from most of my remaining sirup. The process that I pursued, from beginning to end, was the same as recommended by Mr. Webb and others in your report of last year. No difficulty was experienced until we came to the boiling, straining, and skimming. Various things were tried for clarifying the juice, but nothing was thought to be as good as the clear lime-water. This was added while the juice was running from the mill, and then passed through a fine flannel strainer into the pan, well skimmed before boiling, and then strained again; and the boiling continued as rapidly as possible. With my greatest exertion, I could not complete the whole process, from the cutting the stalk to taking the sugar from the fire, in less than two hours. My boiler was a pan five inches deep, made of Russia iron; would hold twenty-five gallons, but my ordinary charge was from fifteen to twenty. I planted an acre of corn for the purpose, built a mill with iron rollers; made from the acre six hundred pounds weighed in the sirup when condensed to the crystalizing point. An uncommonly severe drought lessened my crop nearly one-half. From a careful experiment made with two rods of the best corn I had measured and weighed by itself, shows that the produce, had it been equally good, would have been one thousand pounds. In cultivating the corn, plucking off the ears, &c., I followed the directions given in your report. I satisfied myself by weighing a quantity of large stalks of rank growth, and an equal amount of small stalks that grew thick together, that it is best to grow the stalks so thick that no ears will be produced.

There are several things relating to this cornstalk sugar enterprise, that I think are now established beyond a question. One is, that cornstalks, when properly cultivated, contain an abundance of saccharine matter, and that it *can* be converted into good crystalized sugar. Another is, that the

amount that may be produced from an acre has, probably, never been over estimated.

Again: the remarkable *difference* between stalks that have produced corn, and those that have not, as regards their sweetness. But there are some four or five things that need to be made *as clear*, and to be *as well established*, before complete success will attend our efforts.

1st. There must be something more effectual than clear lime-water for clarifying the juice. After the juice is passed through a common strainer to remove the coarser matter which it may contain, something should be added, that will perfectly collect all the feculent particles and all foreign matter into a curdy precipitate, that will rise to the surface when the boiling commences, when it may be removed by the skimmer.

2d. Some means by which crystalization may be sure and more perfect. It is altogether probable that the difficulties here would be very much lessened, if not entirely removed, by remedying the difficulties in the first case.

3d. The point of concentration should be so defined, that it may be boiled to that point, without going beyond it.

4th. Draining, or removing the molasses from the grained sugar. So far as my experience goes, I have found much difficulty here. The common methods by which *maple sugar* is made to drain freely, will have little or no effect when applied to cornstalk sugar. When the crystals are well formed, the whole mass seems to be of an adhesive, gummy nature, that renders it strongly retentive of its molasses.

5th. A *cornstalk taste* to the sugar. This would be a very serious objection, if it could not be obviated.

At these five points lie all the obstacles in the way of complete success. These *can* and *will* be overcome. To my own mind it is clear, that all these difficulties lie, mostly, in the first case—namely, *not properly clarifying* the juice.

It is, no doubt, highly important that the whole process, from the cutting of the stalk, should be performed with all possible despatch; but I cannot imagine how it can be performed in the short space of time recommended by Professor Mapes. It must be with some apparatus of which I have no knowledge, or else it must be done in very small batches. I trust we shall hear more from that gentleman in your forthcoming report; also from many others that have engaged in the business during the last season.

Thus I have endeavored to give you some idea of what I have done, and made some suggestions, probably, without giving one *new idea* on the subject. If, indeed, I have *done that*, I shall be amply rewarded. I feel a deep interest in this enterprise, and nothing discouraged by my partial failures this year. I intend to engage in it next year, having a first rate mill and other apparatus, besides a small stock of experience, to which I hope to make great additions from the experience of others.

Very respectfully, your obedient servant,

M. ADAMS.

Hon. H. L. Ellsworth,
Commissioner of Patents.

No. 13.

Letter of Rev. L. Humphrey on cornstalk sugar.

Edwardsburg, *January* 15, 1844.

Sir: I this day received your favor of the 2d instant, and hasten to answer it. I rejoice you are collecting and sending abroad important information upon the subject which you mention.

From the notice which you have seen respecting my experiments in making *sugar* from *cornstalks*, it is possible that too high expectations have been raised in the community, as I have attended to it only on a small scale, under many disadvantages. I very cheerfully comply with your request to inform you as to my mode, success, difficulties, &c.

I would say to you, sir, that I at first commenced my experiments in the early part of the season of 1842, soon after the corn-tassel had come out. Not having but very little information upon the subject at that time, of course I could not expect to accomplish but little. I at first passed a few stalks through a hand machine, after the leaves were stripped off from the stalk. This experiment fully answered my expectation. I then set about procuring a mill to be operated by a horse. As there was no one in my neighborhood who had seen a machine of that description, it was difficult to engage any one to undertake the business for a considerable time. After the machine was prepared, it was found necessary to make repeated alterations before it would operate to advantage. In the mean time, the corn was getting ripe, and the frosts came before much could be accomplished. I, however, made some sugar and several gallons of molasses, which was by numbers pronounced equal, and by some superior, to that from the cane. *Five gallons* of the juice, after having been expressed, would produce about *one gallon* of thick molasses. The ears of corn were plucked from day to day to give my swine, from early roasting until the corn was quite ripe. The stalks earliest deprived of ears, of course, were much the sweetest; but even those where the corn had become glazed, furnished a pretty good supply.

Before I commenced boiling the juice, I have generally passed it through a woollen cloth, and, after putting it into the kettle, immediately added a spoonful or a spoonful and a half of quick lime of the consistence of cream, to each gallon. Then I commenced the operation of heating—rather slowly at first, so that the scum might have opportunity to rise and be removed before the boiling commenced. As soon as the scum is all removed, let the boiling proceed as rapidly as possible by a steady fire, so that the liquor need not rise and fall, but continue a steady evaporation until it becomes sirup. It may then be put into another vessel to settle two or three hours, or over night, if convenient. When sufficiently settled, it may be drawn off, or carefully poured from the sediment. Then a quick fire should be raised, and the sirup should, during the remaining process of boiling, be kept as nearly as possible in one place. To prevent it boiling over, a little butter may be put into the kettle or boiler; and, in addition to that, a small bushy stick (that is, a stick with small thick limbs) should be held in the boiler, just within the top of the foaming liquid, constantly moved with a quick horizontal motion, until the necessary evaporation is completed; which may be known by partially cooling a little of the sirup, (say a spoonful,) and dipping the thumb and finger into it, and then sud-

denly separating them. Should a small fibre be produced by the operation, an inch long, it is supposed to be boiled enough to put into shallow vessels to granulate. It has been said by some that much advantage is gained by boiling in shallow broad vessels. Of this I have not had sufficient experience to give my opinion. I can, however, say that, when I have had the evaporation performed as *quick* as possible, there has been much less of what some call the strong *corn taste*, than when the evaporation has been gradual.

Before I commenced the rapid boiling by a quick fire, I found the sirup was very liable to be scorched; and it was some time before I could be convinced that a *hot* fire was less likely to produce a bitter taste than a moderate one. After all, it is according to philosophical principles that it should be so. So long as the boiler is constantly moistened with the liquid, and never suffered to rise above that point, there would be little or no danger of scorching, however great the heat. But, if it should be suffered alternately to rise and fall, it is easy to see that, when the boiler should become nearly red-hot, and then the sirup dashed upon it suddenly, the bitter taste would be likely to be produced immediately. *Too much care* will not be likely to be used in this particular in the manufacture of sugar from *cornstalks.* Some, perhaps, may consider it of but little consequence; but experience, I think, will show it to be of vast importance. Should a suitable process be instituted and carried forward, I know of no reason whatever why the best quality of refined sugar cannot be obtained from cornstalks. To show you that molasses *has been*, and *can be*, manufactured from cornstalks, which will be preferred to the article manufactured from cane, I will state one fact: A gentleman in my neighborhood, who had an opportunity in 1842 to purchase cane molasses within a few rods of his door, for 66 cents per gallon, came to me, and, of his own accord, offered me 75 cents per gallon for the molasses which I had made from cornstalks, although I had then had but *very little* experience in the business. In 1843, the article which I manufactured was decidedly preferable to that of 1842.

You desire me to send you a sample of sugar. I regret exceedingly that I cannot comply with your request; but when I give my reasons, I suppose you will excuse me. I have never made but a small quantity of sugar, (and that in 1842.) I had never dreamed of having an application from the *city of Washington* for a specimen of my sugar; and as there were many neighbors, and those who passed by, near and remote, who wished to see and taste, and as I was desirous to gratify my friends, my sugar was long since *tasted* away.

I would remark, that the past season was very dry in Michigan. When the stalks were forming, and, of course, the juice did not contain probably one half of the saccharine matter as the year before, I was not in a situation that I could well attend to the *extra* care of boiling for *sugar;* so that I made none in 1843. I am sanguine in my hopes that, after a few years, *most families* who raise corn can manufacture their own *sweets* and vinegar without any great expense. As I suppose you wish to benefit the common people generally, I will now proceed to describe the mill which I use, and the manner of feeding it. It is in form like an old fashioned cider-mill. The cylinders are 20 inches in diameter, turned smooth; 18 inches in length, the same bigness. The upper part of one is sufficiently small to enter a crooked sweep placed on the top, and sufficiently long to be turned around by one horse with ease. Near the top of the cylinders, where they

are of a size, into the one attached to the sweep cogs are inserted, with corresponding mortises in the other cylinder.

In feeding the mill, the stalks, after being deprived of their leaves and tassels, are laid upon a platform near the hopper—the small ends towards the mill. If the stalks are large, only one may enter between the cylinders at once; but the operation may be repeated as often as necessary, observing to have the butt ends pass singly, but in quick succession. In this way, the stalks may be passed through the mill about as fast as a man can take them up. Unless the mill be made very tight by keys, it may be necessary to pass the stalks through the mill twice; but the second time it may be done probably three times as quick as the first time. There will then be no special need of care with respect to the butts, and several may be passed at the same time. The mill will need to be strongly built, especially if it is sufficiently tight to express all the juice by once passing through.

The mill I have described may answer common purposes; but, if persons wish to go extensively into the business, it may be suitable to have cast-iron cylinders smoothly turned, and so geared as to run horizontally, and from two to three feet long—thus giving an opportunity of throwing in a number of stalks at once. The boiling should commence as soon as may be after the juice is expressed, to prevent fermentation; and the mill should be frequently washed with cold water.

From the experience I have had upon the subject, I am inclined to believe that sirup will soonest granulate in the early part of the season—that is, soon after the silk is formed. My best success in this respect was early; after having boiled the juice to thick molasses, I put into it nearly *twice its quantity of cold water, and boiled it again to a proper consistency;* then put it into a shallow vessel, and the sugar began to granulate in *less than a week.*

It has been said by some, that corn for sugar should be drilled in planting, so as to have the stalks not more than three or four inches apart in the row one way, and about two feet six inches from row to row. It is possible that the same *quantity* of stalks may contain more saccharine matter, planted in that way, than if the stalks were permitted to grow large; but it can easily be perceived that it will take nearly as much time to strip the leaves and handle a small stalk as a large one; and the quantity of juice from the latter will be much the greatest. In whatever way the corn may be planted, I am fully convinced the land should be so manured and cultivated as to produce a large crop, to make it the most profitable for sugar.

I have entered much more into particulars than I anticipated when I commenced answering your letter, and probably the details may be entirely superseded by communications which you may receive from those far more experienced in this comparatively *new*, but, as I think, *very important* business.

Very respectfully, yours, &c.,

LUTHER HUMPHREY.

Hon. H. L. Ellsworth.

Letter of Messrs. Hubbard and Burdick, on cornstalk sugar.

KALAMAZOO, 1844.

SIR: Your letter, asking information relative to our success in the manufacture of sugar from cornstalks, was duly received. From various reports, and your published information and opinion in relation thereto, we were induced to try the process, and built us a mill, for grinding the stalks, of the following description: Three wooden rollers, twenty one inches in length, and twenty inches in diameter, with a concave on the back side to carry the stalks through, and which brought them out to the same side they were put in.

The experience we have had is limited. The drought in this place, having been of long continuance, rendered the stalk of little value to yield juice, and we cannot, therefore, give you any fair statement of what can be made per acre; neither had we any means of ascertaining, by reason of the stalks being brought us from different places, and in small parcels, and at different times. We are, however, strongly inclined to the opinion that there might be made from 500 to 600 pounds per acre—allowing the season to be good, and the apparatus of good construction, and in order for making the same; nor can there be a doubt but it may yet be made a great source of wealth to this western country, when it is properly understood how to make it to the best advantage.

Our manner of process was, after extracting the juice, (by horse power,) to boil it in pans made of tin, of fourteen sheets each, with sides of wood six inches wide, and which held about a barrel and a half, placed over arches; and by boiling the juice down one hour, it was fit to place in pans for graining. It requires great care and attention to prevent burning it. We made a quantity of sugar, but more molasses, which was a good article; and, from the trial we have given it, convinces us that sugar from the cornstalk is within reach of every farmer who cultivates land for this purpose.

One fact we ascertained—by stripping the stalks clean, and weighing them before and after passing through the mill—that they had lost more than one-half of their weight; so that it is clearly evident there is at least one-half juice in the stalk.

We would offer a few remarks as to the best mode of constructing mills to extract the juice from the stalk. Say: have two iron rollers of twenty inches in diameter, and two feet long, with iron gudgeons of three inches in diameter, with cogs attached to the same, *placed horizontally*. The rollers should be at least two inches thick, to move by horse or water power, with about the same velocity as a common cider-mill.

Boiling.—We think the best way is to boil the juice, after cleansed with the milk of lime, to a moderate sirup; take it off, and let it stand about six hours; then carefully drain it from the dregs, adding about one tablespoonful of sal-eratus, when dissolved, to three gallons of sirup; boil until it operates exactly the same as does maple-sugar.

We shall be pleased to forward at any time further information, and any facts that may come to our knowledge. We accompany this with a small sample of sugar;

And remain, sir, respectfully, yours,

DAVID HUBBARD,
IRA BURDICK.

Hon. H. L. ELLSWORTH.

No. 14.

Letter of Messrs. Tillotson on cornstalk sugar.

New River, La., *November* 1, 1843.

Dear Sir: According to promise, we send you the result of our experiment on cornstalk for sugar; also, the product per acre from sugar cane; for, by comparing the two, the question whether the cornstalk can be profitably manufactured must be decided.

We planted the 8th of April, 1843, four acres in corn, in drills; half of which were 3, and half 4 feet apart; and when thinned out, the stalks stood about 3 inches apart in the rows.

The corn was well cultivated and in fine condition; ploughed three times, hoed twice, and harrowed once, and grew large.

The embryo ears were taken off three times, and before the kernels were formed.

It was cut, rolled, and boiled on the 28th of July, after the tassels were dead, and the fodder beginning to dry. It was topped about 5 feet high, and a very little above, when the embryo ears were taken. The bottom of the stalk appeared more juicy and ripe than the top. The 4 acres produced 60 cart (body) loads, and yielded 1,800 gallons of juice, weighing 8 degrees by the sirup-weigher, which, when boiled to the granulating point (139 degrees Beaumé's thermometer, or 44 degrees by the saccharometer,) produced 200 gallons of sirup, and showed no appearance of granulation after standing two months in the coolers; the cause of which was probably owing, in part, to the unripeness of the cornstalk when cut; but, provided it had granulated as well as usual for the cane sirup, it would have produced 1,300 lbs. of sugar, and 82 gallons of molasses.

Cost of cultivating and manufacturing 4 acres of corn—man and team.

4 days preparing ground	$4 00
1 day opening furrows	1 00
1 day covering corn	1 00
2 days, one person dropping	1 00
1 day ploughing corn	1 00
8 days hoeing	4 00
1 day harrowing	1 00
2 days ploughing, second time	2 00
4 days hoeing	2 00
2 days ploughing, third time	2 00
10 days taking off ears	5 00
4 days, second	2 00
4 days, third	2 00
12 days cutting for mill	6 00
5 days loading carts	2 50
3 days hauling	3 00
8 horses rolling 9 hours	4 00
4 drivers	2 00
4 persons feeding mill	2 00
1 person and horse carrying bagasse	1 00
4 kettlemen boiling	2 00

2 firemen, $9\frac{1}{2}$ hours	$1 00
4 cords wood	8 00
Expenses	59 50
1,300 lbs. sugar, at 5 cents	65 00
82 gallons molasses, at 20 cts.	16 40
Product of 4 acres	81 40
Product of 1 acre, $20 35.	
Deduct expenses	59 50
Net product of 4 acres	4)21 90
Net product of 1 acre	$5 47

Cost of cultivating and manufacturing four acres of sugar-cane.

4 days preparing ground	$4 00
1 day opening furrow	1 00
10 days stripping and dropping	5 00
1 day covering with plough	1 00
1 day covering with hoe	50
1 day barring with plough	1 00
12 days first hoeing	6 00
1 day harrowing	1 00
2 days second ploughing	2 00
8 days second hoeing	4 00
2 days third ploughing	2 00
8 days third hoeing	4 00
16 days cutting for mill	8 00
$4\frac{1}{2}$ days hauling 100 loads	4 50
5 loaders, 30 hours	3 75
8 horses, 30 hours rolling	13 00
4 drivers	6 00
4 feeders for mill	6 00
4 kettlemen	6 00
2 firemen	3 00
16 cords of wood	32 00
1 man and cart carrying bagasse	3 00
Putting up sugar	50
Expenses	$117 25
Product of four acres of cane, 8,000 lbs. sugar, at 5 cents per lb.	$400 00
480 gallons molasses, or 60 per hhd. sugar, at 20 cts.	96 00
Product of 4 acres of cane	496 00
Expenses of cultivation and manufacturing	117 25
Net product of 4 acres of cane	4)378 75
Net product of 1 acre of cane	$94 68

According to our test, the corn-stalk juice required very little lime, and that principally to get the temper. The most simple mode of ascertaining the striking point, (or when the sirup is boiled sufficiently,) and one of the most perfect, is, by dipping into it a small skimmer, (milk skimmer,) and blowing through it; and when the bubbles rise on the opposite side, in diameter (say) three-fourths of an inch, and before they blow off, the boiling is completed.

Objections may be made to many of our calculations, but the result will be nearly the same. We admit that an extraordinary yield of cornstalk may produce double this amount; the same may be said of sugar-cane—2,000 lbs. per acre is a common yield for good plant cane; and seldom has a season passed without our making it.

We have just commenced making sugar this season, and rolled none but ratoon cane, (which usually produces much less than plant cane,) and it produces exceeding 1,000 lbs. per acre; and this has been an unfavorable season for cane. The juice of the corn, as before stated, weighed 8 degrees. The juice of the cane we are rolling weighs 8 degrees also; and, by lowering the knives, (topping lower,) it would weigh $9\frac{1}{2}$ degrees, and later in the season it will be still sweeter.

We think it an error to suppose the sugar cane will not mature in this country. Cane, like the cornstalk, begins to ripen from the bottom. True, the seasons are too short to mature entirely to the top, though often they do mature six or seven feet high. We are now cutting from 2 to 4 feet.

It seems to us, making sugar or molasses from cornstalks is impracticable, except far in the interior, or far from water or railroad communication.

It appears to be overlooked by some writers on the subject, that sugar-cane, in this country, is only planted once in three, four, or five years—usually every three years; that three, four, or five crops, are taken from one planting.

We have often made exceeding a hogshead, or 1,000 lbs., from an acre, the fifth season after planting; thus making, from one planting, six to eight hogsheads of sugar.

The longer the ratoons are cultivated, the drier (the less juicy) the cane becomes.

We doubt not many of our sugar-planters may doubt the correctness of this statement; nevertheless it is true, and we trust none who know us will question the statement. It is customary to burn off, early in the spring, the trash or leaves from the cane-fields. We seldom burn any, but rake them into the centre, between the rows, and bar the cane, turning the furrows on them, where they soon form manure to nourish more vigorously the plant, and the better to protect the ratoons for the succeeding crops.

In expressing the juice, some use steam mills. We use horses and mules, believing them cheaper, as they are all needed to work the crop. We work 24 horses to one mill, making 3 changes; 8 horses carry the mill, and are capable of taking off a crop of 400 hogsheads of sugar.

Our mill, cylinders, housing, and wheels, are cast-iron, with wrought-iron journals, and composition or brass boxes; cylinders $3\frac{1}{2}$ feet in length, by 2 feet in diameter, and work horizontally, cost about $2,000. The cost of a mill suitable for expressing 25 gallons of juice per hour from cornstalks, worked by one horse, would probably not exceed $300, if all made of iron;

wooden housing, on which the cylinders and boxes set, would answer well, and the expense would be much less.

We were in hopes to be able to send you more favorable results.

Very respectfully, yours,

S. & R. TILLOTSON.

Hon. H. L. Ellsworth,
Commissioner of Patents.

No. 15.

Letter of Mr. Webb on cornstalk sugar.

Wilmington, *December* 30, 1843.

Dear Sir: I have never received the letter of which you speak, on the subject of maple sugar; but I have received one from you on the subject of corn and cane sugar, written by S. & R. Tillotson, which is herewith returned, as requested. In relation to the communication of these gentlemen, I would remark, that they estimate the profit of cane culture much higher than my former information had led me to consider it. The net annual revenue of many Louisiana planters must (according to their estimate) equal, if not exceed, the salary received by the President of the United States. But, as I have no practical acquaintance with the subject, I will not presume to doubt the correctness of their calculations. Their experiment with corn appears to have been well conducted, and I have no fault to find with any part, except the inferences which they draw from it. It does not follow, because *they* have failed, that others may not succeed; or, that they themselves may not in future arrive at a more favorable result. It may be that a more northern latitude is better suited to the crop. I have never known the juice to weigh so light as 8°. Here, it has uniformly ranged from 9° to 10°. The fact that their sirup failed entirely to granulate, shows that there must have been something wrong either in the crop or in its manufacture; and, of course, no certain inference can be drawn from the result of their experiment. But, admitting that no objections of this kind could be urged: has it not been just as completely proved, by careful experiment, that steamboats could never succeed? Has it not been theoretically demonstrated, on scientific principles, that railroads could never be used as a means of rapid communication? Such cases have been too numerous, and are too well known, to require any more than a mere allusion to them. It may be considered as settled, that the manufacture of corn sugar, in the large way, cannot be profitably carried on by the process which succeeds with cane. There is a foreign substance in the sirup, which this process fails to remove, and which prevents its speedy granulation. This is a great objection to the manufacture on a large scale; and, though it cannot be considered an insurmountable one, it must be admitted that it has not yet been obviated.

The family manufacture, by farmers, can, however, be safely recommended as entirely practicable, for the sirup may be used to the same advantage in a liquid as in a solid state. If, in manufacturing, evaporation is hastened by the use of flat-bottomed pans, with such other arrangements as will insure its speedy accomplishment, and the sirup, after

being boiled sufficiently, is kept at a temperature not under 70°, it will never fail to granulate. It has been found, from experience, that pans made of Russia sheet-iron, six inches deep, are well suited for evaporation. It must not be forgotten, when corn is cultivated for sugar, that it is not the only valuable product which may be secured.

The leaves and tops from an acre of corn, (planted closely,) are equal in value to an acre of good grass.

The Messrs. Tillotson found the expense of growing and manufacturing one acre of corn for sugar, to amount to $15. If we admit that the produce of an acre in hay is worth an equal sum, then it follows that, whatever sugar or molasses may be made, is so much clear gain.

I send you a sample of corn sugar made the last season. I have had but little time to devote to it, and, of course, there is but little that is new to communicate.

I am, respectfully, yours,
WILLIAM WEBB.

Hon. H. L. Ellsworth,
Commissioner of Patents.

No. 16.

CHINA TEA.

Washington, *January* 31, 1844.

Sir: The sample of *tea* sent to you by Mr. Puckett, and which you requested me to examine, appears to be a species of Sida, (perhaps *S. rhombifolia*,) a genus of plants belonging to the malvacea or mallow tribe; a family abounding in mucilaginous plants, and formerly held in much repute as emollients, &c. The whole family is said to be destitute of unwholesome qualities. The bark of many is very tenacious, and used as a substitute for hemp.

You will perceive, on masticating a leaf of the sample, that it is very mucilaginous. This is probably what Mr. P. alludes to, when he says it has a *green* taste and smell, if not scalded before drying. I regret the leaves are so much broken that the species cannot certainly be ascertained. There were neither flowers nor seed in the sample.

Respectfully, your obedient servant,
WM. RICH.

H. L. Ellsworth,
Commissioner of Patents.

Notes on the tea of China.—The tea districts in China extend from the twenty-seventh to the thirty-first degree of north latitude; and, according to missionaries, it thrives in the more northern provinces. Kampfer says it is cultivated in Japan, as far north as forty-five degrees. It seems to succeed best on the sides of mountains, among sandstone, schistus, and granite.

In 1810 a number of tea-plants were introduced into Brazil, with a colony of Chinese to superintend their culture. The plantation was formed near Rio Janeiro, and occupied several acres. It did not, however, answer the expectations formed of it; the shrubs became stunted, cankered, and moss-grown, and the Chinese finally abandoned them. Tea prepared from these plants was formerly, and may be at present, served out to visiters at the garden.

The English, in 1834, attempted to cultivate tea in Upper Assam, where it is said to be indigenous; but it proved a failure.

No. 17.

Letter of S. Scott, esq., on the acclimation of seeds.

North B street, Capitol Hill, *January* 13, 1844.

In the year 1817 I sowed several varieties of turnip-seed, to ascertain which kind appeared to do best in the United States, and, finding the green-top turnip the most disposed to grow, (and undoubtedly the best to eat,) I have ever since cultivated this kind with the greatest care; and having now become thoroughly acclimated, the crop from this seed, with proper cultivation, is equally as certain of producing well in Virginia, as any other crop usually raised by farmers. Indeed, for many years I have never failed having a good produce of turnips, when properly managed; and the like success has usually attended the culture of this seed by my neighbors, whilst that from other places has generally failed.

In 1835 a seedsman in England sent me a present of a small quantity of fourteen varieties of turnip-seed, one of which was the "green-top turnip," and exactly of the same variety as the one I had cultivated in Virginia for many years; and my son being desirous to test the difference between acclimated and foreign productions, (having often heard me mention a conversation once had with the much-lamented Doctor Perrine,) we determined to give this matter a fair trial; and therefore, in June, 1835, we covered over with manure just two and a half acres of land, (from which we had previously cut a heavy crop of grass,) which was embanked round so as to keep out the waste water from the adjoining land, excepting only the washings from a large fold-yard, full of cattle, which it had received for several years; and then ploughed up the land, a moderate depth only, with a common two-horse plough; following the same with a one-horse coulter-plough, to lighten up the substratum in each open furrow; and after the land had been made firm by rain, it was well harrowed over, and then rested until the middle of July, when it was cross-ploughed, coultered, harrowed, in like manner, and at each ploughing the land received a dressing of plaster and ashes; and on the last day of July the whole piece was back-furrowed into ridges two feet apart, and the coulter-plough passed twice along the open furrows between the ridges. The ridges were then split, and a ridge thrown over these open furrows, when the open furrows made by this second ridging were coultered as before; and on the 1st day of August, (being just the right time to sow turnip-seed in Virginia,) eighteen and a half of these ridges, (which were each exactly one hundred yards long, making about one-quarter of

an acre,) having first been made smooth with a hoe, were drilled on the top with the produce of the turnip-seed imported in 1817, in two rows four inches apart, and alternate ridges of the remainder of the field were drilled, in like manner, with the same seed; and afterwards, fourteen of the alternate ridges left unseeded were drilled, in like manner, with the fourteen varieties of seed sent from England in 1835—one row with each variety; and then repeated, in like manner, until the whole piece of land was seeded. That is to say, about a quarter of an acre was drilled with seed first imported in 1817, and acclimated; and then every other ridge of the remainder of the land with the same kind of seed, and the remaining alternate ridges with the seed imported in 1835. The plants were afterwards thinned to about four inches apart, and ruta-baga plants were set in the vacant places; and between the rows was well coultered and hoed, until the plants became too large to pass between the rows. It also ought to be mentioned, that the plants, when just coming up, were dusted over with about four bushels of fresh wood ashes and plaster to the acre.

Now, although we had many heavy rains during the autumn, and much wash from the fold-yard ran into the turnip field, yet the coulter-ploughing rendered the under strata so porous that the earth readily absorbed the whole. About the middle of November we commenced gathering the roots of these turnips into baskets, each containing a bushel, when we found that the eighteen and a half rows drilled with the seed imported in 1817, and of course acclimated, produced full three hundred bushels—being after the rate of a bushel on every six yards of each row, and twelve hundred bushels to the acre; and the remainder of the rows drilled with the same kind of seed produced equally as well, but that only one of the fourteen varieties imported in 1835 produced more than one-half of that quantity, and several of them scarcely any good turnips at all. The one that did produce well, was a red-topped variety, cultivated by several persons about the District, under the name of the variegated red turnip; but I do not see any of them now in the market, and I imagine they have now (for want of properly cultivating the seed) degenerated into what is called water-turnip, which is nothing more than the turnip returning again to its original carlock, or charlock, or ketlock. Now, the result of this experiment satisfied us that a vast crop of turnips may be produced on good land by proper cultivation and acclimated seed; but that the crop will generally fail from imported seed until it has become acclimated, or from seed improperly raised; and every observation we have since made tends to confirm this opinion.

This piece of land the next year was planted with potatoes, and produced full five hundred bushels to the acre. The potatoes planted were of the long red-stock kind.

Yours, most respectfully,

STEPHENSON SCOTT,

Late of Ossian hall, Fairfax county, Va.

H. L. Ellsworth, Esq.

No. 18.

New method of obtaining cream from milk: by G. Carter, of Nottingham lodge, near Eltham, Kent.

The process of divesting the milk of its component portion of cream, to an extent hitherto unattainable, has been effected by Mr. Carter, and is thus detailed by that gentleman in a paper presented to the Society of Arts:

A peculiar process of extracting cream from milk, by which a superior richness is produced in the cream, has long been known and practised in Devonshire; this produce of the dairies of that county being well known to every one by the name of "clotted," or "clouted" cream. As there is no peculiarity in the milk from which this fluid is extracte d' it has been frequently a matter of surprise that the process has not been adopted in other parts of the kingdom. A four-sided vessel is formed of zinc plates, twelve inches long, eight inches wide, and six inches deep, with a false bottom at one-half the depth. The only communication with the lower apartment is by the lip, through which it may be filled or emptied. Having first placed at the bottom of the upper apartment a plate of perforated zinc, the area of which is equal to that of the false bottom, a gallon (or any given quantity) of milk is poured (immediately when drawn from the cow) into it, and must remain there at rest for twelve hours. An equal quantity of boiling water must then be poured into the lower apartment, through the lip. It is then permitted to stand twelve hours more, (i. e. twenty-four hours altogether;) when the cream will be found perfect, and of such consistence that the whole may be lified off by the finger and thumb. It is, however, more effectually removed by gently raising the plate of perforated zinc from the bottom, by the ringed handles, without remixing any part of it with the milk below. With this apparatus, I have instituted a series of experiments, and, as a means of twelve successive ones, I obtained the following results:

Four gallons of milk, treated as above, produced, in twenty-four hours, 4½ pints of clotted cream; which, after churning only fifteen minutes, gave 40 ounces of butter. The increase in the cream, therefore, is 12½ per cent., and of butter upwards of 11 per cent.

The experimental farmer will instantly perceive the advantages accruing from its adoption, and probably his attention to the subject may produce greater results.

No. 19.

Letter of Mr. Fox, on preserving butter.

Hartford, *January* 12, 1844.

Sir: In answer to your inquiry, What has been your practice in putting up butter, especially for preservation in hot climates, or for long voyages? I will cheerfully state that I have had considerable experience on this subject, and, in some particulars, good success. There are many things required to insure good butter. The butter itself must be well made; that is, worked enough, and not too much, and salted with rock salt. This being well done, and the buttermilk all expelled, the butter may be packed in good

white-oak, well-seasoned casks, well filled. In cool climates larger casks can be used. In hot climates it is best to have small casks—say from 25 to 30 pounds—so that too much need not be exposed while using. Then put these small casks into a hogshead, and fill up the same with strong pickle that will bear an egg, and the butter may be shipped to the West Indies or Europe, and kept perfectly sweet. I have never found saltpetre or sugar of any benefit. Butter of my packing has opened as good in the West Indies as it was in Connecticut. I will remark, that to keep butter in ice houses, when it remains frozen, will answer, if the butter is to be continued in the same temperature; but if it is exposed to warm weather after being taken from the ice-house, it will not keep as long as if it had not been exposed to so cold a temperature.

Yours, respectfully,

G. FOX.

Hon. H. L. Ellsworth,
Commissioner of Patents.

No. 20.

Letter of J. R. Stafford, esq., on lard oil and stearine candles.

Cleveland, Ohio, *January* 1, 1844.

Dear Sir: Since my last communication, contained in your report for 1843, I have made very great improvements in the manufacture of lard oil, refined lard, and stearine candles. Since the first introduction of the above in the northwest by myself, two years since, the increased consumption of oil has been very great. The amount of lard and tallow worked into oil and stearine candles in this vicinity, the past year, is about 250 tons; last year [1842] about 80 tons. Like all new manufactures, it at first labored under many difficulties. The greater was to separate and refine the oil and stearine. By many who have engaged in the business, it was supposed that the same mode as is adopted with sperm would answer; this, experience has proved to the contrary. Sperm always crystalizes in hard, flat scales, and requires only mechanical means to separate the fluid. With lard, the crystals are in needles, and very soft; and pressure has only a tendency to confine the fluid parts that may naturally or artificially be separated. That impure oil, in moderate quantities, may be obtained in the usual mode of simple compression, by the use of alcohol, camphor, acids, alkalies, &c., is true; but the usual modes are either too expensive, or the agents used are deleterious. Since I put up my new works in the spring, I have pursued my improved plan, which is to precipitate the stearine. The oil is then drawn off, and filtered through cloths, which retain the minute crystals held in suspension. By this operation, the precipitated crystals become firmer, and will admit a heavy pressure without changing their form; so that most of the oil is excluded without regranulating, or the use of hydraulic power. The oil and stearine of lard is mechanically combined—not chemically, as many suppose. It is the minute fibres of gelatin, or the cellular tissue, which holds them: when this is entirely separated, there is no more adhesion than there is between sand and water. It is the presence of so much more gelatin in the right whale than in the sperm, that makes the difference in the oils. The great complaint has been, that consumers could not obtain lard oil in sufficient quantities for winter use. I shall this week transmit you, by

Mr. Milford, the collector of the customs of this district, a bottle containing some of the kind in general use in this city and vicinity, which will stand at a very low temperature—I think as low as 20 degrees; which is several degrees lower than is ever wanted for any practical purpose. The oil is now in general use throughout the west for machinery, wool, and light; and it is gradually coming in use at the east. The reason is, that a great deal of the poor, half-manufactured stuff, that cannot be sold at home, is shipped there. When in New York, in August last, I saw several barrels of gut-fat lard sold as lard oil. When the people at the east are enabled to discriminate between a good and poor article, it must grow in favor with them. But the greatest difficulty we labor under is, the want of capital to make a winter oil, and keep it on hand until the next fall, when merchants, manufacturers, and others lay in their stock. During the past season I have supplied the railroad company from Syracuse to Albany; and could have continued to supply them and the North river boats, could I have given them winter oil. At Lowell it is used to some extent; but the demand there being so great, they have not been enabled to get enough of uniform quality to adopt it generally.

The candles made from the stearine sell for from 15 to 20 cents per pound, by the box, both here and at Boston. They are about equal in light to a first-quality tallow candle; but burn twice as long, and are not greasy in warm weather. The general price of lard this winter, throughout the State, is 4½ cents. The price cannot be much above this, as the low price of butter and tallow must keep it down. Tallow and butter are as easily separated as lard; and the oil of tallow is well adapted to machinery, light, and wool, and will stand a low temperature. It is generally used with us as tanners' oil, and answers that purpose better than that imported from the east. I have worked, from 1st May to 1st August, the average of 3,500 pounds of lard per day. Since that time the supply of lard in this section has been light, and the average has been much below that. We are not well located for a supply of the raw material, except during navigation, as but few hogs are grown in this section. The States of Indiana and Illinois are best adapted to this business. There, the two great staples, hogs and corn, are indigenous; there, the business can be pursued with most profit and least expense; for, when the hog is fattened, he can be turned into the steam-tub, minus hams, blood, and entrails, separated by heat the fat from the lean, bone, and muscle. Twelve hours after the fat is cold, oil and candles can be produced.

Mr. Milford will detail to you the results of the experiment of burning lard oil in the light-house and beacon at this port, where it has been exclusively used since the opening of navigation. The result, I hope, will lead to its adoption by the Government in the light-houses of the west; and if economy, cleanliness, and brilliant light is an object to you in the east, you would lose nothing by its adoption. Assuming pork to be worth $1 50 per hundred, upon navigable waters in Indiana and Illinois, I could, by my improved process, deliver first quality lard oil in New York at 37½ cents per gallon, and candles such as I have described at 12½ cents per pound, and leave a good broad margin for profits. The oil is now quoted at 65 cents per gallon in New York. Candles are various prices, according to quality.

Yours, respectfully,

J. R. STAFFORD.

Hon. H. L. ELLSWORTH, *Washington.*

No. 21.

Letter of Isaiah Wing, esq., on lard oil and stearine.

Cincinnati, *December* 26, 1843.

Sir: Agreeable to the request in your communication of the 13th instant, I have made all the inquiry into the subjects therein suggested, that the time which I have been able to devote to them would admit of. With regard to the trying of lard by steam, I can only say, as yet, it is in its infancy, and I think bids fair in a short time to supersede all other modes. There are in our city at this time four establishments for the trying of pork, and making it into lard by the power of steam, and are found to answer the purpose most admirably well; the lard that is manufactured by the steam process certainly exceeds all other in beauty, and, I think I may safely add, in goodness; it is made perfectly white and pure by this process, from the fact that it cannot be burned; neither can it be colored, if proper care is taken to keep the works clean. There is also a great saving in labor and expense by the steam process; likewise, an increased quantity of lard from the same amount of pork. I feel confident the old method of trying up pork in large kettles, fully exposed to the action of the fire for the purpose of making it into lard, will be wholly at an end in this city in a year.

As to the packing of beef for the English market, as far as I have been able to learn, it is this: All parts of the bullock are used but the head, feet, and legs—to be cut as nearly as possible into pieces of 8 lbs. each; it is then put into casks, and they are filled with good pickle, made with a sufficient quantity of saltpetre to give the meat a bright color; it should be kept in this pickle until the blood is sufficiently purged out; it should then be removed, and packed in barrels containing 25 pieces, or 200 lbs., or packed in tierces containing 38 pieces, or 304 lbs. The casks should be perfectly water-tight, with two iron hoops at each end, made just to fit. The pieces should be well turned, laid smoothly into the casks, and between each layer a sufficient quantity of fine salt, and over the top of the whole an inch or two of good coarse Turks' island or St. Ubes should be placed; when the casks are headed up, they are filled with good strong pickle made from pure salt alone. The same method is to be observed in curing pork; but it must be cut into 4 pound pieces, as near as possible, and all parts of the hog are used except the head, feet, and legs to knee-joints. Each packer should brand his own name on the head of each cask, with the number of pieces, and description of the beef or pork. Fine lard for culinary purposes should be packed in good white kegs, containing about 40 pounds each; it should be poured into the kegs, and allowed to cool before heading; a piece of white paper to be laid on, to prevent it adhering to the top when opened. In all cases, care should be taken to have the kegs perfectly full. As to the result of converting lard into oil and stearine, I have ascertained the business is carried on very largely in this city; as to other places, I have but little information. There are now in this city thirteen factories in full operation, making from three hundred to twenty-five hundred barrels each, in a season. R. W. Lee & Co. manufacture twenty five hundred barrels of lard oil per annum, or one hundred thousand gallons. The oil manufactured by Lee & Co. commands, in this city, 60 cents per gallon by the barrel, and 75 cents at retail. The stearine made by Lee & Co. amounts, as they inform me, to about 750,000 lbs.

per annum, two-thirds of which is summer stearine, and suitable for making candles; this stearine sells at 7 cents per pound at the factory. The other (winter stearine) is used for culinary purposes, and will compare with the best leaf lard, and generally commands about 6 cents per pound when put up in good kegs in shipping order. I am informed that they are manufacturing lard oil at Columbus, (Ohio,) Pittsburg, Wheeling, Indianapolis, St. Louis, Springfield, Nashville, New Orleans, and various other places; using Lee & Co.'s patent for that purpose. The cost of transportation of a barrel of beef from this place to England I cannot state precisely, because the price varies so much, and so often; from this place to New Orleans, say from 37 to 75 cents per barrel; but the cost of the transportation of a barrel of beef or pork from this place direct to Liverpool, including commissions, may, in general, be set down at $1 75 per barrel as a fair average price.

The foregoing is all the information that I have been able, at this time, to obtain relative to the subjects of your inquiry. Should you wish for any specific information relative to the statistics of this part of our country, I shall be happy at any time in aiding you to obtain it, if the desired information should be within my reach.

I am, very respectfully, your obedient servant,

ISAIAH WING.

H. L. Ellsworth, Esq.,
Commissioner of Patents, Washington.

No. 22.

Report of the committee of the Franklin Institute on the burning of lard oil and sperm oil.

Hall of the Franklin Institute,
Philadelphia, 1844.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred, for examination, the comparative amount of light to be obtained from one pound of lard, and one pint of best sperm oil, burned in two lamps manufactured by Messrs. Cornelius & Co., of Philadelphia, Pa., report:

That they performed carefully two sets of comparative experiments, intended to determine the relative economy in burning of sperm oil and lard. The sperm oil (which was of the best quality) was burned in the solar lamp of the Messrs. Cornelius & Co., the merits of which are already upon record in a former report of this committee; while the lard was burned in the new lamp devised for this purpose by the same makers, which is of the same principle, and is only so far modified as to adapt it to burn to advantage the new material.

The first experiments, which were tried upon the evening of January 25th, and lasted during two hours, were directed chiefly to the determination of the quantity of LIGHT given by the respective lamps; which, being tested every fifteen minutes by the photometer, (of the same construction as that used in former experiments*,) was found to remain precisely equal. The

* This construction is that proposed by Mr. Ritchie as a modification of Bouquer's.

quantity of material burned was also nearly the same, viz: about one-third of a pound.

Upon February 6th, two other lamps were prepared, (similar pattern,) filled respectively with oil and lard, lighted at 12 h. 45 m., and continued burning until 7h. 15m., (viz: six hours and a half,) at which time the lard was entirely consumed. These experiments confirmed, in a striking manner, the results of the first set; for although the lard lamp (having a slight defect in trimming the wick, which was perceptible in its burning) was, at first, slightly inferior to the oil, it finally regained its ground, and continued increasing somewhat in brightness until the exhaustion of the material put an end to the experiment. The quantities of materials burned during this period of 6½ hours were as follows:

Oil, 13.25 ounces, (about 0.9 pint.)
Lard, 14.25 " or 0.9 pound.

The committee have not determined, as before, the economical value, by dividing the quantities of light by the expense; because the values of the two materials vary so much in different sections of the country, as to render this method not only useless, but even deceitful.

The committee subjoin the tables containing the details of the experiments.

FIRST EXPERIMENT, JANUARY 25, 1844.

Lamps lighted at 7h. 40m.

No.	Time.	Distance.		Quantity of light.		Ratio.
	H. min.	Oil.	Lard.	Oil.	Lard.	Oil = 1.
1	8 0	45.4	45.4			
2	8 15	45.4	45.4			
3	8 30	45.4	45.4			
4	8 45	45.4	45.4			
5	9 0	45.4	45.4	2,061.16	2,061.16	1 : 1
6	9 15	45.4	45.4			
7	9 30	45.4	45.4			
8	9 45	45.4	45.4			
9	10 0	45.4	45.4			

SECOND EXPERIMENT, FEBRUARY 6, 1844.

Lamps lighted at 12*h.* 45 *m.*, *P. M.*

No.	Time.	Distance.		Quantities of light.		Ratio.
	H. min.	Oil.	Lard.	Oil.	Lard.	Oil=1.
1	1 45					
2	2	48.1	46.2	2,313.61	2,134.44	1 :0.92
3	2 15					
4	2 30					
5	2 45					
6	3					
7	3 15					
8	3 30	48	46.3	2,304	2,143.69	1 :0 93
9	3 45					
10	4					
11	4 15					
12	4 30	47	47.3	2,209	2,237.29	1 :1.01
13	4 45					
14	5	46	48.3	2,116	2,332.89	1 :1.10
15	5 15					
16	5 30					
17	5 45					
18	6					
19	6 15					
20	6 30	45	49.3	2,025	2,430.49	1 :0.12
21	6 45					
22	7					
23	7 15					
24	7 30	48.6	45.7	Lard exhausted.		

General average - - - - - - - -	1: 1.05
Consumption of oil - - - - - - - -	13.25 oz.
Consumption of lard - - - - - - - -	14.25

By order of the committee:

WM. HAMILTON, *Actuary.*

Gas-light from lard.

In forming a tabular estimate of the relative expense of gases for illumination, there will be found much to reconcile from different chemists; and I think the best to be relied on, as having had most practice therein, will be Brande, Faraday, Ure, and Philips, in England; and Graham, Bridges, &c., in the United States; most of whom are now living. And, from the fact that these gases are of rather recent use, the latest statements from them will be most useful, and in which the inventor of the apparatus in question agrees. The above named all agree in their statements as to the density and illuminating power of coal gas, and oil gas, and cost of oil, for lamps; and their statements are, that from 1½ to 2 cubic feet of oil gas is equal to from 5 to 6 feet of coal gas; their density, also,

is in similar agreement—namely, taking air at 1,000. All allow light-carburetted hydrogen, or coal gas, to be from 559.5 to 600, and the density of oil gas from 189.2 to 196.2; thus does the density of the illuminating power corroborate the opinion usually assigned the two gases.

In applying these to the gas made from lard, it must be remembered that the whole article—that is, stearine and oil—is converted as much as possible into gas; and that its carbonaceous quality, in that case, is equal, if not superior, to other common oils; in which case, the relative cost will be nearly ascertained from the following facts: The gas apparatus in question will supply 76 gas-burners of great illuminating power, which burn 4 hours per day; and the quantity of lard consumed is under 45 lbs., (which costs $1 35, being of the worst kind, and answering equally as the best.) This is about 5½ gallons of oil, and 1 gallon usually makes 100 cubic feet; therefore, the whole is about 500 or 550 cubic feet of oil gas; and this is nearly or quite equal to thrice the same amount of coal gas. But what is of importance in connexion with the mode of manufacture and apparatus, is a process, (chemically, by mechanism,) by which the *density*, *illuminating power*, and *bulk* of the gas are increased, and this by means of a *self-acting* and *self-regulating* machine—the nature of which is only known to the inventor, and was put up only for experiment, and is kept private.

The size of the apparatus in question, which is equal to the supply of 500 burners constantly, or 3,000 four hours per day, at the lowest computation, occupies a space in the engine-room of 3 feet 6 inches by 5 feet, and altogether self-acting, except a small fire necessary to be kept under it; the expense of which, and all other extras, amounts to 15 cents per day. But the inventor anticipates, by chemical combination, to defray the *whole* expense of making gas, by the compound derived from it. As the whole apparatus will shortly be patented, the particulars will be fully developed; and the inventor would have felt great pleasure in forwarding the whole particulars, but some gentlemen, with whom he expects to carry out the invention, being, at present, absent from town, is the cause of his not feeling fully at liberty to do so by this post. But the great probability is, that, in a few weeks, he will be in Washington, and will feel pleasure in naming the whole, and in some improved mode of combustion—a sample of which, a private party here was much gratified with a short time since, and an experiment on a large scale is now being completed.

Extract from the specification of the patent granted in England to James Crutchett.

My improvements in the manufacture of gas are generally for mixing with coal gas, oil gas, or other gas used as a source of light or heat, any required proportion of atmospheric air, or oxygen, or of atmospheric air and oxygen, in order to cause more perfect combustion; also, for introducing, as an additional element into such compound or mixture of gases, vapor of naphtha, or other volatile hydro-carbon, so as to form a triple combination of combustible gas, combustible vapor, and gas capable of supporting combustion, from which light and heat may be obtained more economically than from ordinary gas. The proportions of atmospheric

air to be introduced vary with the quality of the gas. I have used, with advantage, as much as 25 per cent. of atmospheric air with coal gas; but from 5 to 15 per cent. is a more usually advantageous proportion. With oil gas, various proportions—up to 80 per cent., or, in some cases, even more—may be used, according to the quality of the gas, and the light or heat required.

The mixture is best effected by means of the apparatus hereinafter described, which may be applied either at the gas-works, or on a smaller scale by each consumer to the gas used by him. By means of this apparatus, the pressure of the gas itself is applied as a moving power, to draw in and mix with the gas (previous to its issuing from the burners) the desired proportion of air gas, or vapor, or of any combination thereof, as aforesaid.

I would observe, with respect to a part of my invention, that I am aware that a mixture of coal gas and naphtha vapor has been employed for the purpose of illumination. But, by the first mode, owing to the difficulty of supplying the flame with sufficient air to insure combustion, only a limited proportion of naphtha (seldom more than a gallon per 1,000 feet of gas) can be perfectly consumed; and the second mode, from the entire absence of carburetted hydrogen, has been found too difficult of management to come practically into common use.

My improvement overcomes both these defects, by the employment of a triple compound, easily lighted and managed, and rich both in the carbon to be burnt, and in the air necessary for its combustion.

And I would be clearly understood to disclaim the combination of coal gas and naphtha vapor, and the naphtha box, as not being new; and, also, to disclaim the combination of air and naphtha vapor alone, as not being new. What I claim being, the obtaining a triple compound of gas, air, and vapor for combustion, as described, and the application of the apparatus described to the production of that particular result.

Having thus described the nature of my improvements, and the modes of effecting them which I consider simplest and best, I would observe, that I do not confine myself to those particular modes, nor to the particular form or arrangement of the apparatus described. But I claim any suitable mode of carrying my improvements into effect, in accordance with my claims, which I will, in conclusion, briefly recapitulate.

First. I claim the admixture of atmospheric air, or other supporter of combustion, in any required proportions with coal gas, or other illuminating gas, previous to its issuing from the burner.

Second. I claim the plan of employing the pressure of the stream of gas, by the intervention of suitable apparatus, to draw in the air, gas, vapor, or any combination thereof, which it may be desired to introduce.

Third. I claim the plan of using a drum, revolving in water, as described, to draw in air, gas, vapor, or any combination thereof; and I claim the plan of connecting the said drum with the drum of a gasometer, in order that it may be driven thereby.

Fourth. I claim the triple compound of combustible gas with air, or gas capable of supporting combustion, and vapor of volatile hydro-carbon, for the purpose of combustion; and,

Fifth. I claim the mode of forming burners, as described.

In witness, whereof, &c.

JAMES CRUTCHETT.

Enrolled January 12, 1843.

No. 23.

Letter of J. W. Gill, esq., on drying flour.

Mount Pleasant, O., *December* 8, 1843.

Dear Sir: Your esteemed favor of the 29th was duly received and contents noted. In confirmation of the facts previously communicated, and to illustrate some others more fully, I herewith send for your examination various accounts of sales (numbered from 1 to 7) of our manufacture and brand of flour, of various lots made and held for long periods of time here and in southern climates, and exposed to all the changes incident—as shipping on our rivers; lying in flat-boats, and on the levee, and in warehouses, in New Orleans; reshipments by sea to Boston, Charleston, Rio Janeiro, &c., during the hottest and rainiest weather at the south; with an extensive correspondence of my agents at New Orleans and Rio Janeiro during the past summer, (numbered from 1 to 12,) fully and clearly establishing the following important facts: that, under all situations, it all remained good and merchantable, and sold in whatever port it was disposed of, for the quality it was branded; standing inspection and reinspection, and commanding the highest prices of new or fresh-ground flour in said ports at time of sale. Although much of these several lots of flour was from ten months to eighteen months old at time of sale, yet you see, by account of sales, that there was not a single barrel of sour, musty, oily, or spoiled flour. Had these several lots of flour been manufactured in the ordinary modes, and submitted to the same tests, they would invariably have spoiled. You can make your own deductions from the evidences submitted. I am convinced that I can with certainty manufacture, and also instruct others to manufacture, flour of a quality equal to any made in the United States, that will remain merchantable in any climate for at least twelve months, and then make as good and wholesome bread as any fresh ground; and also that it would make, on an average, sixteen pounds of bread per barrel more than other flour, as per New Orleans bakers' certificate sent to Rio Janeiro. These are important improvements which no other manufacturer has yet succeeded in establishing; though many have attempted it, both east and through this region, they have failed and abandoned the attempt. At New Orleans it was attempted; but, after three years' experimenting, and a loss of $20,000, they gave it up, having so prejudiced the bakers against all dried flour, that it was difficult even for me to sell them a good article, after I had completely succeeded, (if they knew it was dried,) for some time after. I therefore sent my flour there, and had it stored until I wished it sold; then sold it as other flour, and its superiority and keeping qualities gained it its present high reputation; which to attain, has cost me much in experimenting, in time and money.

Respectfully, yours,

JOHN W. GILL.

Hon. H. L. Ellsworth.

GILL'S KILN-DRIED FLOUR.

Recommendations from New Orleans, Mobile, and Rio Janeiro.

Under advices from Felter & Lonsdale, New Orleans, October 12, 1843, it is stated that, out of one thousand barrels inspected, only two or three

appeared to be spoiled, (and they seemed to have been made out of bad wheat,) after standing through the whole summer in that climate. It was the opinion of the best judges that the "Gill brand" would drive all others out of the market.

Advices under date of June 4, 1843, from New Orleans, same firm, say: "We are much pleased to say to you that your flour is getting very much in demand everywhere, and daily increases." A lot was sold at $6, when the common price was slow at $4 35 to $5.

From the same, May 30, 1843, say: "The last you sent to Mobile has had a good effect; so much so, that others have sent to us, and we could not get off selling them twenty-five barrels at $6, and to-day a few barrels at $6 50." Superfine of ordinary kinds selling for $5.

From Rio de Janeiro, September 19, 1843.—Maxwell, Wright, & Co. say: "The cargo of the Warsaw, with the exception of *your brand*, has, we understand, suffered from its long passage. We have not yet had any full report regarding it; but, from two or three bakers, we hear they approve of it."

From Rio de Janeiro, September 30, 1843.—Maxwell, Wright, & Co. say, of the "Gill brand:" "The quality proved *very* good, and the sales here very good, considering the difficulties of introducing a new brand into a market already glutted, and at a season when new wheat is expected hourly."

No. 24.

JAUFFRET'S MODE OF MAKING MANURE.

Specification of a patent granted to Archibald Richard Francis Rosser, of New Boswell court, in the county of Middlesex, esq., for improvements in preparing manure, and in the cultivation of land. Sealed August 2, 1837.

To all to whom these presents shall come, &c., &c.: Now know ye, that, in compliance with the said proviso, I, the said Archibald Richard Francis Rosser, do hereby declare the nature of the invention is described and ascertained in and by the following statement thereof, that is to say:

The invention relates to a mode of reducing into manure, and applying the same to the cultivating and fertilizing of land, whereby land may be dressed, cultivated, and manured with greater advantage than has heretofore been practised—not only broom, heather, furze, rushes, and other vegetables not hitherto used for making manure, (as being deemed too difficult of decomposition,) but also vegetables and weeds; such, for instance, as couch grass, which it has hitherto been considered dangerous to introduce into manure, and the vegetating powers of which are, by the invention, totally destroyed. The principal object effected by the invention is, the production of a rapid fermentation, the degree of which may be regulated nearly at pleasure, whereby the substances to be converted into manure are speedily and uniformly decomposed. The inventor found it very convenient and effectual for facilitating the conversion of substances into manure, to prepare a liquid beforehand, which he called "*eau à saturée*," and which I will call saturating water. This satura-

ting water may be conveniently prepared thus: Form a tank or a water-tight pit, proportioned to the dimensions of 12 feet long by 6 feet broad, and 6 feet deep; fill the tank to the extent of half its depth with water, throw in such herbaceous or even woody plants as may be within reach, taking care to make use, in preference, of those containing the most unctuous and mucilaginous parts. With these plants and the water, the tank is to be filled up to the extent of three-fourths of its depth; add, of the nearest earth or soil, sufficient only to leave one foot in depth of the tank unoccupied; then put in 10 pounds of unslaked lime, and 5 ounces of sal-ammoniac. The tank may afterwards be filled and kept full with kitchen water, or any sweepings, dead animals, spoiled provisions, and filth from the dwelling-house. The contents of the tank should be stirred together from time to time. Should much unpleasant odor be evolved, or insects be produced, more unslaked lime should occasionally be added. The next thing to be done is, to prepare a smaller water-tight vessel, tank, or pit, into which is to be thrown a sufficient quantity of the saturating water to dissolve or mix the ingredients after mentioned; or, if there is no saturating water prepared, water as impure and putrid from animal and vegetable substances as can be conveniently procured.

The inventor calls this water mixed with the matters next mentioned, a lessive. By the words *fecal matters*, or *fecal substances*, hereafter used, I mean human ordure. About 130 gallons of the lessive may be prepared for the conversion of 1,000 pounds of straw, or 2,000 pounds of green, woody, fibrous vegetable substances, into 4,000 pounds of manure. The lessive, with the sufficient quantity of saturating, or impure water before mentioned, may be composed of the substances following, and in about the following proportions, that is to say: 200 pounds of fecal substances and urine, (the greater the proportion of fecal matter the better,) 50 pounds of chimney soot, 400 pounds of powdered gypsum, 60 pounds of unslaked lime, 20 pounds of wood ashes not lixiviated, 1 pound of sea salt, 10 ounces of refined saltpetre, and 50 pounds of what the inventor called *levain d'engrais*, and I call leaven of manure—being the last drainings from a preceding operation, where there has been one. The saturating water is to be well stirred till it is thick, and a portion of it is to be immediately poured into the lessive tank, into which are to be thrown the lime, the soot, then the ashes, then the fecal matters, the salt, and afterwards the saltpetre. The gypsum is to be thrown in powdered, little by little, always stirring the mixture lest it should cake; when the whole is well mixed by stirring, the leaven of the manure is to be added.

Although I have mentioned various primary or preferable substances for the composition of the lessive, yet, where these cannot be used with due regard to economy, substitutes may be employed.

For the fecal substances and urine, 250 pounds of the dung of horses, oxen, cows, or pigs; or 100 pounds of the burnt, baked, or roasted earth, for the gypsum; 100 pounds of the dung of sheep or goats, for the chimney soot; the same weight of river mud, hill-side mud, sea mud, fat earth from woods or forests, marl, or dust, or mud of the high road; for the wood ashes not lixiviated, 50 pounds of wood ashes lixiviated, or 2 pounds of pot-ash; for the sea salt, 100 pounds of sea water; for the refined saltpetre, any quantity of rough saltpetre, or common saltpetre, or mother water of saltpetre containing 10 ounces of pure saltpetre. Whenever the quantity of a lessive fails for a making, or runs short, it is to be made up

12

with the saturating water, and that again with water, always using the most impure and putrid from animal and vegetable matters that can be obtained. In the place where the substances to be converted into manure are to be heaped for that purpose, the surface of the ground is to be rendered impervious to liquids by beating, paving, or otherwise, in such a manner as that the liquids running from the heap may flow unabsorbed into pits or reservoirs placed or constructed at a lower level. For making the heap, straw may be used; whole furze, broom, and other woody stalks, may, with effect, be cut into lengths of from 6 to 8 inches, or bruised, that they may pack the closer, and retain the lessive the better. It is very advantageous to throw the vegetable substances to be reduced into manure, into a vessel, tank, or pit, containing a quantity of the lessive; the lessive having been previously made as muddy as possible, by stirring. The substances are to be trodden or beaten among the lessive; and, as fast as they are well soaked and slimed all over, they are to be thrown upon the heap. The heap may conveniently be made 7 feet high, and upon every layer of a foot deep there should be thrown in a drenching of the lessive, first stirring it well. When the heap is raised to its full height, the muddy sediment of the lessive (which has not been stirred up into the liquid) is to be spread equally over the top surface of the heap. The top of the heap should then be covered with straw, old planks, branches or herbage, or any other suitable matters. While the heap is making, it should be beaten or trodden down, so as to make the substances of which it is composed lie close and compact; and when it is finished, it should be beaten all round with the same view. At the end of 48 hours from the completion of the heap, a fermentation of from 15 to 20 degrees of heat by Reaumur's scale, has been found to have taken place; and on the following day, it has generally attained from 30 to 40 degrees of Reaumur. On the third day, the top of the heap is to be opened to 6 inches deep, with a fork, and the sediment thrown on the top is to be turned over, and another good drenching with the lessive is to be applied to the heap, which is again to be immediately covered up. About the seventh day, holes about 6 inches distance from each other are to be made with a fork to the depth of 3 feet, and another drenching is to be applied, the heap being afterwards covered up again. About the ninth day, another drenching is to be applied, through new and somewhat deeper holes, and the heap is to be covered up again. After the lapse of from 12 to 15 days from the making of the heap, the manure will be fit to spread. The fermentation is stopped by an excessive drenching, or by opening out the heap. If the materials of the heap are straw only, the fermentation may be stopped at 55 degrees of heat; otherwise, it may be allowed to proceed to 75 degrees. All the drainings should be carefully collected, and used over and over again for the drenchings, and the residue should be preserved for subsequent makings. In all processes of fermentations, it necessarily happens that variations of heat and time take place, according to the temperature of the atmosphere, and the materials acted upon, and other causes. And it is advisable not to make the heap in very cold weather; but the inventor found that the process here laid down was the best for suitable fermentation which (after numerous experiments made during many years) he could devise. The experienced farmer will, in the composition of his lessive, have regard to the nature of the soil to

which the manure is to be applied; and into the lessive, more or less of lime, or the alkalies, for instance, according as the soil is of a warmer or colder nature.

The invention consists in the composition of the lessive, and the process of repeatedly using the lessive for producing fermentation, which may be regulated nearly at pleasure, although the proportions of the materials composing the lessive may be reasonably varied, and although such variations may, in some degree, retard the required decomposition of the heap.

In witness, &c.

Enrolled February 2, 1837.

Jauffret's experiments on manures.

The account given by Mr. Jauffret of the manner in which he arrived at his discovery of the method of preparing manure, may illustrate the character of the process, as it shows that it is the result of long experience and repeated trials of a great variety of articles. The following particulars are translated partly in his own words, and partly in substance, from a pamphlet, in French, published by him a few years since in Paris. He says that his father having possessed a small farm of fifty acres in Aix, (Provence,) which had been in the family for years, as the eldest son he felt great desire to cultivate it, and restore its exhausted fertility. In the year 1798 he felt the necessity of increasing the quantity of manure, for he had but two oxen on which to rely as a supply for his land. He first established sewers along the road bordering his farm, into which he cast vegetables and woody stalks, in order to soften and impregnate them in that liquid. This operation was accomplished in about a month, and in this way he obtained, as he says, "a little manure, though of a poor quality." This procedure was adopted for three years. He then prepared a meadow in the following manner: After having opened a ditch two feet deep, and a foot wide, to receive the running of the waters which remained on the land covered with reeds, he formed a pile—four horse-cart loads of earth taken out of the place—and brought to it one small load of pigeon and poultry dung, which he prepared by making alternate layers of the earth and dung; the composition was prepared from the 8th to the 20th of February, and then laid on the meadow. Previous to this, he had tried soot alone; which produced no effect, especially on the moister part of the soil. Having continued this operation for several years, he found that the meadow being more dry and well manured, the reeds disappeared, and were replaced by good pasturage. This, however, was not sufficient, as the manure formed by spreading the vegetables and weeds in the road and the yard was small in quantity, and of a poor quality, and he needed large heaps to manure his meadow and other grounds.

Continuing his efforts to find out means to increase his manure heaps, he cast into layers the woody matters he gathered from his sewers; and to hasten the process of fermentation, which was long, he threw in also a portion of stable-dung. This produced some improvement in his manure, and he was enabled thus to bury it up. But still the effect on the soil

was small; and if he had more in quantity, yet one portion was thus deprived of its fertilizing liquids, without materially benefiting the other. He next tried ploughing in green crops of rye or barley in the flower; this was very beneficial, but answered for a single harvest only. Perceiving the effect of burying the barley, he was led to conjecture the benefit he might derive from substituting this for the animal portions of the manure, when they were deficient; and he began to think that it was necessary not only to have manure, but of that kind the operation of which should be lasting on the soil; and that he must prepare it so that the cost of transportation would be the least, and the quantity to be used as small as possible for the object to be obtained.

His mind was now so occupied with the purpose he had formed, that he went ten leagues to obtain manure; and a horse-cart full of it cost him three days' travel and toil. At this distance, at that time, the offal of beasts was not prized, and they threw it into the river, and therefore he could have it at only the loss of time and labor for drawing it. To lessen the time, he also purchased sheep dung at a low price, at the distance of seven leagues. Observing now the different effects of the dung he used, he says: "I conceived the idea that it might be possible, perhaps, to compose graduated manures, and all my thoughts were now bent to the solution of that problem." He wished to produce manure equal to stable dung. He spent many years in various experiments for this purpose. "Here" (he says) "commenced one of those remarkable phases which have signalized the discovery of my method. I collected the waters of my barn-yard, and, improved by all those different efforts, I soaked my straw in that liquid, and I heaped them up with care on a platform of beaten earth. I failed not to see that the liquid ran on the stalks of straw glazed by nature, and that, not penetrating at all the vegetable tube, decomposition was impossible; the liquid ran off, without effect. I continued, and frequently watered it; but all my endeavors were in vain. Another person, perhaps, discouraged, would have ceased all attempts of this kind, but I persevered; and to subdue the interior of the stalks of the rebellious straw, I caused it to be trampled on by a horse, and, besides this, I also put under the feet of the horse, oak leaves, rosemary, thyme, wild lavender, reeds, and herbs from the marshes; and while the horse was treading them down, I often watered them. I supposed that, thus bruised together, they would furnish me with a more solvent liquid to penetrate my straw; and I was led to make that experiment, because, having spread out those vegetables in my barn, I had noticed that they lost their humus on being exposed to the air and rain; while, in thus trampling them, they lost nothing."

He finally reached, as he remarks, "the true era" of his method. He placed in a heap those different materials, and, "being sprinkled with this liquid, they perceptibly underwent a remarkable change. The decomposition, though gradual, was very perceptible. But another obstacle now arose; I perceived that I was short of my dunghill liquid, how great soever was the care I used to lose nothing, and that I must forcibly arrest the process at once, or I had need of more manure."

He then (as he says) came to the conclusion that he ought to endeavor to make manure at pleasure, so that it would be ready whenever needed; for from the stables he obtained only a little each day. He therefore took care to lose nothing that might increase the water in his yard, kitchen, sewers, ashes, leached or otherwise; these he took with great

care into a sewer in his barn-yard. On spreading the manure so made on his meadow, the effect was very perceptible. "Thinking that odoriferous plants, if mingled in, and bruised up, would furnish a liquid which would be more permanent in its effect; and, later still, the idea came to me of using water saturated for the preparation of my leach, which was begun by a cold infusion of the vegetables in water, with a little earth, sal-ammoniac, and lime. I observed that the period of vegetation is the most favorable to use plants in this mode, though they may be used in the whole season to make the saturated water."

He next made experiments with a variety of different animal, vegetable, and mineral matters.

"Having spread on a point of meadow, soot of the chimney, I noticed the pasturage, in process of time, to be composed of a coarse herbage, which my beasts did not eat voluntarily. On another portion I spread fecal matter only, also pigeon dung, and other animal offals; and I soon saw that they produced good results, but it was exhausted by the first crop, and it was necessary to manure it the next year; and thus it would not answer on the point of economy."

He also tried ashes, plaster, lime, and burnt earth, which he found more or less satisfactory, and more or less enduring. One day, also, in cleaning out his cellar, he gathered a quantity of earth, which appeared to contain shining particles; these, as he supposed them to be saltpetre, he put on his meadow; and the vegetation produced was marvellous, and he determined to add this to his composition.

He spent three years in these and other experiments; and thus he learned the real and intrinsic value of the various matters applied as manure to the soil, and classed them accordingly. For the same purpose, he made trial of different kinds of soils.

The thought then came to him, that, if he combined those particular substances which alone produced different effects in vegetation and in duration, he might obtain a manure more durable and effective; and so, if he calculated the proportional powers, more than one ought to be produced, and thus a union of strength might be obtained.

He then applied himself to study the nature of inundated grounds, and noticed that they produced more and longer than those manured by man, and gave four or even five successive harvests. He examined different kinds of inundated earths, and found them more or less composed of animal and vegetable remains, and mineral particles, (especially of insects;) a fatty and soft earth; fragments of leaves and wood; crystalized portions; grains of calcareous, and marly, and argillaceous substances.

He now rejoiced at the solution of the problem; for he was convinced that, by the re-union of the three kingdoms, he could produce a more durable manure. He therefore gathered the soils of ponds, rivers, &c., and cast them into his sewer, with plaster, soot, and fecal, and vegetable substances; and perceived that the liquid thus produced was better than before. He made dung-heaps of straw and other vegetables, and sprinkled them with this liquid. He continued the experiments in various ways, with success; his harvests became better; but still, in an economical point of view, the question of proportions was not yet decided. He felt that, since he had discovered the materials of which to compose his heaps, what was now needed was to find the liquid by which to sprinkle them: and the facts he had gathered in the course of years ought to lead him to

the composition of that liquid, to replace that of beasts. On examining urine, both liquid and dry, he found it to consist partly of a white and sharp part, which appeared like lime; and partly of a saltish crystalized shiny substance, which seemed to contain salt, ammonia, saltpetre, and potash. He then thought that, if he could combine the true proportions of lime, salt, saltpetre, ammonia, and wood-ashes, he would certainly produce—by uniting, also, fermented liquids, which would supply the place that animal organization exercised over urine, and form sal-ammoniac—a species of liquid, which could answer instead of urine, and thus furnish, at any moment, all the liquid substance he would need to prepare his dung-heaps in time for the sowing of seed.

He also reflected, that the more he could vary the action, the easier it would be for him to convert into manure straw, dry substances, stalks of barley, maize, thistle-hemp, turf, and even the most difficult of vegetables—as broom, briars, &c., which, by known processes, are decomposed only after years, and form but an imperfect manure.

Having, by means of the increase of his crops, been enabled to purchase a horse, he now weighed the water he drank, and the urine voided—which he found to be but one-third of the former. So desirous was he to ascertain it, that he frankly confesses that he watched the animal day and night, that none might be lost. He also weighed the dung, which, contrary to that of the urine, was heavier than the food taken—being, doubtless, increased by the mixture of a portion of the water in the stomach.

He had now discovered the constituent parts of the liquid to supply the place of urine; but he did not know the proportions, and observes that, if he had been a chemist, he would doubtless have succeeded without much difficulty; but, on the other hand, a mere chemist could not have made his discovery, since the putting it on the earth, and comparing it with dung of beasts, could only furnish positive results.

Finally, after numberless trials, he succeeded. He composed a lye with plaster, lime, soot, saltpetre, ashes, and the liquid composition of his dung-heaps, in which he had one part of urine joined to fecal matter, and consequently sal-ammoniac, all in reasonable proportions, based on actual trial. This lye was richer than urine, as he could vary the elements; and thus composed graduated manures, adapted for different soils and plants—a thing of great importance—while the usual method of dung-heaps gave no such advantage.

His discovery was thus attained; for, on the one hand, he combined a powerful manure with vegetable, animal, and mineral matters, mixed and decomposed by an active fermentation, which reached to 50°, (afterwards he pushed it to 75°;) while that of the dung-heap reaches no higher than 45°; and, on the other hand, he had composed a liquid which might aid that fermentation, and added to the substances converted into manure all the principles necessary to secure a fine and durable vegetation; and he could, at will, increase his store of manure.

He found that the dung of cattle and swine was cold in its nature; that of horses, warm; of sheep, more so; and, employed (as happened) on soils, lost their efficacy. On the contrary, by his method, he could regulate and adapt the manure to the soil, &c., increase or diminish it in warmth or cold, moist or dry, and substitute one for another as needed: thus, for instance, the harvest of hemp frequently failed for want

of a warm manure, which will bring forward the plant in two, three, or four months, by increasing the animal part, and adding a little fermenting liquid of the manure. This method was tried successfully, at the request of the prefects of Brittany. A part of his briar-heap, after being prepared for a few days, was washed; and, according to a report given at L'Orient on the 1st of April, 1837, "after having been passed into two waters, and entirely freed from its humus, the woody blackish parts were sufficiently decomposed, supple under the fingers, easily taken to pieces; and, of thorny plants, the thorns no longer pierced one handling them." He gives particular accounts of the trials made of his compost on mulberry, vines, and corn.

After having made experiments for eleven years on his land, he was fully convinced of its excellence; and, to test it yet more fully, he caused a machine to be constructed for experiments, which were conducted with great success some years, in a number of places. By the aid of his machine, he mixed together 180 quintals of manure per day, employing two men and one horse. The method which he describes is, to construct a basin, water-tight, to receive the water which is to be converted into lye, 12 feet long, 6 broad, and 6 deep; first, put into it 3 feet deep of water, and cast into this plants and shrubs, taking those which have soft and mucilaginous parts, and especially those which are fragrant—as thyme, sage, broom, small cut-up branches of pine, and particularly eupherbia, rosemary, lavender, &c., according to the locality—in the spring using the green leaves, and using in winter evergreens. These are thrown into the basin, till it is filled within 1½ foot of the top, the liquid covering the top. Then earth is thrown in, till it reaches 6 inches higher towards the top. To this are added 10 lbs. of quick-lime, and 5 ounces of sal-ammoniac; and it is also carefully stirred from time to time with an iron fork. The remaining foot of space is then filled with sweepings and filth of the house, slops from the kitchen, &c. Letting it remain till it is converted into a strong lye, he then applied it to his dung-heaps. He advises, if one has time, to allow it to remain before using two or three months.

The same method, he remarks, could be tried in barrels, &c.

In case one has not time to go through this process, he may prepare a lye by taking pure water; and, though not necessary to be rigid, the general rule is, on 12 hectolitres (equal to about 33 bushels of water) to be saturated, (with which can be made about 10 hectolitres=27 bushels of lye to fabricate 40 quintals, or cwts. of manure,) cast on first a little earth, 1 ounce of sal-ammoniac, some herbs of different kinds, if possible, and 4 or 5 lbs. of quick-lime, besides putting in, from time to time, some pounds, when it has a strong smell. A lower basin, circular in form, water-tight, a foot deep, may also be constructed below the other, so that the liquid may run from the upper one to the other.

The following is a general description of the quantity of substances to be employed in preparing the lye, with their relative proportions, &c.:

1. To convert into manure 1,000 lbs. of straw, or 2,000 lbs. of vegetable matters, green and woody, which will produce about 4,000 lbs. of manure, there is necessary about 27 bushels of lye.

2. The composition of the lye, according to the quantity, is to be made in the following proportions:

	Lbs.	Oz.
Fecal matters and urine	200	0
Soot	50	0
Plaster in powder	400	0
Quick-lime	60	0
Ashes, not leached, (if leached, 50 lbs. more)	20	0
Salt	1	0
Refined saltpetre, (if brown, 1 lb.)		10
Leaven, or liquid substance, or fluid from the dung-hill, obtained from a previous operation in the same manner	50	0

To convert into manure 2,000 lbs. of earth, which must produce 2,600 lbs. of manuring earth, it is necessary to double the substances aforesaid, and put half, at least, of the liquid—that is to say, about 5 hectolitres—or 14 bushels.

Substitutes, which may be employed in place of the above articles, are—

In place of 200 lbs. of fecal matters, 40 lbs. of barley, lupine, or buck-wheat grain, in the sheaf; or 250 lbs. of the dung of the horse, cattle, calves, or swine; or 100 lbs. of sheep or goat dung, &c.

In place of 50 lbs. of soot, 100 lbs of burnt earth.

In place of 400 lbs. of plaster, 400 lbs. of pond-mud or slime, from river or sea-shore, base of a hill, rich earth from the woods, marl, or dust from the highways.

In place of 20 lbs. of wood-ashes, 2 lbs. of potash.

In place of 1 lb. of salt, 100 lbs. of salt-water, or brine.

In place of 10 oz. of refined saltpetre, or 1 lb. of brown saltpetre, 2 lbs. of crude saltpetre, or 5 lbs. of saltpetre brine.

A valuable receipt was lately presented to the New York Farmers' Club, by Dr. Valentine, for the formation of an artificial guano, that would not cost more than one-fifth of the imported, and equally effective. The following are the ingredients:

Nitrate of soda	20	lbs.
Sal-ammoniac	10	"
Carb. ammonia	5	"
Pearlash	5	"
Sulphate of soda	8	"
Sulphate of magnesia	5	"
Fine bone	60	"
Salt	10	"
Sulphate of lime	2	bushels.
Meadow-mud, or street-manure	1	cart-load.
Carbonate of iron	2	drachms.
Manganese	2	"

No. 25.

Comparative tariffs on agricultural products.

Countries.	Duties.
	TOBACCO.
Argentine Republic	35 per cent. ad valorem.
Austria	Leaf, \$7 20 per $123\frac{1}{2}$ pounds.
Belgium	Leaf, 46 cents $7\frac{1}{2}$ mills per 220 pounds, or 100 kilogrammes.
Bermudas	\$1 44 per cwt.; manufactured other than cigars, \$1 92.
Bolivia	5 per cent. on a valuation, and $\frac{1}{2}$ per cent. to the consulado.
Central America	10 per cent. on a fixed official valuation.
Chili	From Virginia—cut tobacco, 20 per cent. on a valuation of \$8 per 101 pounds 12 ounces; chewing, 20 per cent. on a valuation of 25 cents per pound.
Denmark	In leaves and stems, 75 cents per 100 pounds; manufactured—smoking and chewing of all sorts, \$3 per 100 pounds.
Sleswick & Holstein	Unmanufactured, $83\frac{3}{4}$ cents per 110.13 pounds; manufactured, \$3 21.41 per 110.13 pounds.
France	For the régie, free; importation on private account prohibited.
West Indies	\$3 74 per 220 pounds.
Great Britain*	Unmanufactured, 72 cents per pound; manufactured, \$2 16 per pound; stalks prohibited.
West Indies	Jamaica, \$120 for £100 value; manufactured leaf, \$96 for £100 value.
	Antigua, \$96 for £100 value; manufactured leaf, \$72 for £100 value.
American possess'ns	New Brunswick—leaf, free; manufactured, 1 cent. per pound.
	Newfoundland—leaf and manufactured, 4 cts. per pound; stems, 48 cents per 112 pounds.
	Nova Scotia—manufactured, 3 cents per pound colonial duty, 7 per cent. imperial duty; unmanufactured, 4 per cent. imperial duty.
Greece	Toumbako, 17.1 cents, other quality $10\frac{65}{150}$ cents, per 2 pounds 13 ounces 5 drachms.
Hayti	5 cents per pound, in leaves; chewing, 6 cents per pound; 10 per cent. additional in United States vessels.

* In all the British colonies, on manufactured tobacco an imperial duty of 7 per cent. ad valorem is to be added.

No. 25—Continued.

Countries.	Duties.
	TOBACCO—Continued.
Hanseatic cities -	In Hamburg, $\frac{3}{8}$ per cent.; in Bremen, $\frac{2}{3}$ per cent.; in Lubec, $\frac{1}{2}$ per cent. ad valorem.
Italy - - -	\$8 10 per 77 pounds avoirdupois; for manufactured, \$10 per 77 pounds avoirdupois.
Mexico - -	Prohibited.
Netherlands - -	Maryland, 32 cents per 220 pounds; Virginia and other North American, 28 cents per 220 pounds.
New Granada - -	Prohibited.
Peru - - -	Prohibited.
Portugal - -	Duties paid on leaf tobacco by contract; manufactured tobacco prohibited.
Prussia - -	Unmanufactured, \$3 58.52 per cwt. of 113.381 pounds; manufactured, \$7 51.19 per Prussian cwt.
Russia - - -	In leaves with stems, \$4 50 per 36 pounds; in leaves stemmed, \$9 per 36 pounds.
Spain - - -	Prohibited on private account.
Cuba - -	In leaf, admitted to storage; manufactured, prohibited; in carrots, in Spanish vessels 24.78, in foreign vessels 35.8 per cent. on fixed value of \$6 75 per 25 pounds 7 ounces; bale tobacco, same per centage on fixed value of \$4 50 per 25 pounds 7 ounces. Additional, 1 per cent. "balanza," $\frac{1}{7}$ per cent. as war subsidy.
Porto Rico -	Tobacco, of Virginia, in leaf, \$2 88; tobacco, Manilla, of Virginia, \$3 60; in carrots, \$5 40 per 101 pounds. 12 ounces; under all flags, bale tobacco, foreign, \$5 40 per 101 pounds 12 ounces. Additional, 1 per cent. "balanza," $\frac{1}{2}$ per cent. "consulado."
Sweden - -	Maryland leaves, $4\frac{1}{2}$ cents per 15 ounces; others, $4\frac{1}{2}$ cents per 15 ounces; leaves, in rolls, $12\frac{1}{2}$ cents per 15 ounces; stems, $1\frac{1}{2}$ cent per 15 ounces. Additional, convoy duty, 5 per cent. on the imports; town dues, $2\frac{1}{3}$ per cent. on an official valuation.
Texas - - -	Manufactured, 30 per cent ad valorem.
Turkey - -	3 per cent. import duty; 2 per cent. (paid by importer) for privilege of selling.
Two Sicilies - -	\$22 40 per cantaro of 196 pounds; for manufactured tobacco, \$44 80 per 196 pounds.

No. 25—Continued.

Countries.	Duties.
	TOBACCO—Continued.
Venezuela - -	6.01 cents per pound; with an additional 2 per cent. at Laguira, and 4 per cent. at other ports, on total amount of duties; and a further addition of 10 per cent. on the total amount, under the law of July, 1841.
	INDIAN CORN.
Argentine Republic -	Prohibited.
Austria - - -	14.41 cents per 123½ pounds.
Belgium - -	\$2 61.8 per 2,223 pounds.
Bermudas - -	12 cents per bushel.
Bolivia - - -	5 per cent. on a valuation, and ½ per cent. to the consulado.
Central America -	10 per cent. on a fixed official valuation.
Chili - - -	20 per cent. on a valuation of \$1 per 140 pounds.
Denmark - -	25 cents per barrel of 4 bushels.
France - - -	2 cents 4 mills to 48 cents 7 mills per 22 gallons, according to price in France.
West Indies -	37 cents 4 mills per 22 gallons.
Great Britain - -	According to weekly average price in England. For every quarter, a duty equal in amount to the duty paid on a quarter of barley; the sliding scale of duty thus ranging: When the price of barley is \$7 92, and under \$8 16 the quarter, the duty is \$2 96 per quarter; and in respect of every integral shilling by which such price shall be above \$7 92, such duty is increased by 36 cents, until such price shall be \$9 84 the quarter; at or above which, the duty is 24 cents the quarter. When the price is under \$7 92, and not under \$7 68 the quarter, the duty is \$3 32 the quarter; and in respect of each integral shilling, or any part of each integral shilling, by which such price shall be under \$7 68, such duty shall be increased by 36 cents.
American possess'ns	New Brunswick, free.
	Newfoundland, free.
	Nova Scotia, free.
Greece - -	10 per cent. ad valorem.
Hayti - -	\$2 per barrel; 10 per cent. additional in United States vessels.
Hanseatic cities - -	In Hamburg, free; in Bremen, ⅔ per cent.; in Lubec, ½ per cent. ad valorem.

No. 25—Continued.

Countries.	Duties.
	INDIAN CORN—Continued.
Italy - - -	\$1 to \$2 per 640 Roman pounds, (about 492 pounds avoirdupois,) according to price in Italian ports.
Mexico - - -	Prohibited generally; admitted in special cases.
New Granada - -	In national vessels, 27 per cent.; in foreign vessels, 32 per cent. on a home valuation.
Peru - - -	30 per cent. on a valuation.
Prussia - - -	11.38 cents per scheffel, equal to 1.552 bushel. Bavaria has a separate regulation for the import of corn.
Russia - - -	25 cents per bushel.
Spain - - -	Prohibited.
Cuba - -	In Spanish vessels, 24.78 per cent.; in foreign vessels, 35.08 per cent. on fixed value of \$4 per barrel. Additional, 1 per cent. "balanza," and $\frac{1}{7}$ as war subsidy.
Porto Rico - -	In national vessels, 72 cents; in foreign vessels, \$1 per 3 bushels. Additional, 1 per cent. "balanza," $\frac{1}{2}$ per cent. "consulado."
Sweden - -	\$2 per bushel. Additional, convoy duty, 15 per cent. on the imports; town dues, $2\frac{1}{2}$ per cent. on an official valuation.
Texas - - -	20 cents per bushel.
Turkey - - -	3 per cent. import duty; 2 per cent. (paid by importer) for privilege of selling.
Two Sicilies - -	\$1 60 per 196 pounds, in national vessels; \$2 40 per 196 pounds, in foreign vessels.
Venezuela - -	Free.
	WHEAT.
Argentine Confederation	Prohibited when its value is less than \$13 per bushel; beyond, admissible by license at duties proportioned to its value.
Austria - - -	18 cents per $123\frac{1}{2}$ pounds.
Belgium - -	When the price is \$3 74 per 22 gallons and upwards, free; when the price is over \$2 $80\frac{1}{2}$ per 22 gallons, and under \$3 74, \$7 $01\frac{1}{4}$ per 220 gallons; when the price is \$2 20.4 per 22 gallons, and under \$2 $80\frac{1}{2}$, \$14 02.5 per 220 gallons, (or 2,203 pounds;) when the price is below \$2 20.4, prohibited.
Bolivia - - -	5 per cent. on a valuation, and $\frac{1}{2}$ per cent. to the consulado.

No. 25—Continued.

Countries.	Duties.
	WHEAT—Continued.
Brazil - - -	20 per cent. on a valuation of $1 16 per 1.1 bushel.
Central America -	10 per cent. on a fixed official valuation.
Chili - - -	From $1 50 to 50 cents per 150 pounds, according to the price of Chilian wheat; free when Chilian exceeds $6 per 150 pounds.
Denmark - -	25 cents per barrel of 4 bushels.
Sleswick & Holstein	26¾ cents per barrel.
France - - -	Ranging from 4 cents 7 mills per 22 gallons upwards, in proportion as the price of grain diminishes in the French ports.
West Indies -	37 cents 4 mills per 22 gallons.
Great Britain - -	According to the weekly price in England, per quarter, (8 bushels) the duty ranging (sliding scale) from 24 cents to $6 16 per quarter.
Greece - - -	10 per cent. ad valorem.
Hanseatic cities -	In Hamburg, free; in Bremen, ⅔ per cent.; in Lubec, ½ per cent. ad valorem.
Italy - - -	$1 to $2 per 640 Roman pounds, (about 492 pounds avoirdupois,) in proportion as the price diminishes in the Italian ports.
Mexico - - -	Prohibited generally; importation permitted in certain cases in the province of Chiapas.
Netherlands - -	20 cents per bushel.
New Granada - -	In national vessels 25 per cent., in foreign vessels 30 per cent., on a home valuation.
Peru - - -	30 per cent. on a valuation.
Portugal - -	Ranging from 19.8 cents to $2 77.7 per alquiere of 3.07 gallons.
Prussia - - -	$11 38 per scheffel, which is equal to 1.552 bushel. Bavaria has a separate legislation for the import of wheat.
Russia - - -	43 cents per bushel.
Sweden - -	32.64 cents per barrel. Additional, convoy duty, 15 per cent. on the imports; town duties, 2⅓ per cent. on an official valuation.
Texas - - -	20 cents per bushel.
Turkey - - -	3 per cent. import duty; 2 per cent. (paid by importer) for privilege of selling.
Two Sicilies - -	$2 40 per 196 pounds in foreign vessels; $1 60 per 196 pounds in national vessels.

No. 25—Continued.

Countries.	Duties.
	OATS.
Great Britain - -	According to the weekly average price of British oats, ranging from 24 cents to about $3 per quarter, of eight bushels.
American possess'ns	Canada, 72 cents per quarter.
	New Brunswick, free.
	Nova Scotia, 10 per cent., colonial duty.
British Guiana -	10 cents per bushel.
France - - -	According to the price in French ports; colonies prohibited.
Spain - - -	Prohibited.
Cuba - -	35.08 per cent. on a fixed value of $1 50 per $101\frac{3}{4}$ pounds.
Porto Rico - -	26 per cent. on a fixed value of $2 per $101\frac{3}{4}$ pounds.
	POTATOES.
Great Britain - -	48 cents per cwt.
American possess'ns	Canada, 6 cents per bushel.
Bermuda - -	4 cents per bushel.
British Guiana -	8 cents per bushel of 64 pounds.
France - - -	10.285 cents per 220 pounds; colonies prohibited.
Spain - - -	Not specified.
Cuba - -	28.01 per cent. on a fixed value of $2 50 per barrel.
Porto Rico - -	20 per cent. on a fixed value of $2 25 per bbl.
	RICE.
Argentine Republic -	10 per cent. ad valorem.
Austria - - -	43.21 cents per $123\frac{1}{2}$ pounds.
Bermudas - -	36 cents per cwt.
Belgium - -	11 cents 7 mills per 220 pounds.
Bolivia - - -	5 per cent on a valuation, and $\frac{1}{2}$ per cent. to the consulado.
Central America -	10 per cent. on a fixed official valuation.
Chili - - -	20 per cent. on a valuation of $4 25 per 101 pounds 12 ounces.
China - - -	Free.
Denmark - -	$83\frac{1}{3}$ cents per 100 pounds; paddy, 50 cents per 100 pounds.
Sleswick & Holstein	98.21 cents per 110.13 pounds; rough, and in the husk, or paddy, $53\frac{4}{7}$ cents per 110.13 pounds.

No. 25—Continued.

Countries.	Duties.
	RICE—Continued.
France - - -	46 cents $7\frac{1}{2}$ mills per 220 pounds.
West Indies -	74 cents 8 mills per 220 pounds.
Great Britain - -	$3 60 per 112 pounds rough, and in the husk, or paddy, 24 cents per quarter of 8 bushels. In American possessions, free.
West Indies -	In Jamaica, 96 cents per cwt.; in Antigua, 48 cents per cwt.
Greece - - -	6.84 cents per 2 pounds 13 ounces 5 drs.
Hayti - - -	$2 per 221 pounds; 10 per cent. additional in United States vessels.
Hanseatic cities -	In Hamburg, $\frac{3}{8}$ per cent.; in Bremen, $\frac{2}{3}$ per cent.; in Lubec, $\frac{1}{2}$ per cent. ad valorem.
Italy - - -	30 to 60 cents per 112 Roman pounds, (77 pounds avoirdupois,) according to the price in market.
Mexico - - -	Prohibited.
Netherlands - -	5.45 cents per 220 pounds.
New Granada - -	In national vessels, $2 per 101 pounds 12 ounces; in foreign vessels, 5 per cent. additional on the amount of duties.
Peru - - -	30 per cent. on a valuation.
Portugal - -	From foreign countries, $1 19 per $88\frac{3}{4}$ pounds.
Prussia - - -	$1 36.58 per Prussian cwt. of 113.381 pounds.
Russia - - -	45 cents per 36 pounds.
Spain - - -	Under Spanish flag, 40 per ct. on fixed value of $1 50 per 25 lbs. 7 oz.; foreign flag one-third more; additional consumption duty, one-third the amount of tariff duty.
Cuba - -	In Spanish vessels, 24.78 per cent.; in foreign vessels, 35.08 per cent. on fixed value of $1 50 per 25 pounds 7 ounces. Additional, 1 per cent. "balanza," and $\frac{1}{7}$ as war subsidy.
Porto Rico - -	In national vessels, 81 cents; in foreign vessels, $1 17 per 101 pounds 12 ounces. Additional, 1 per cent. "balanza," $\frac{1}{2}$ per cent. "consulado."
Sweden - -	$1\frac{1}{4}$ cent per 15 ounces. Additional, convoy duty, 15 per cent. on the imports; town dues, $2\frac{1}{3}$ per ct. on an additional valuation.
Texas - - -	2 cents per pound.
Turkey - - -	3 per cent.; import duty, 2 per cent. (paid by importer) for privilege of selling.
Two Sicilies - -	$1 60 per cantaro of 196 pounds.
Venezuela - -	Free.

No. 25—Continued.

Countries.	Duties.
	FLOUR.
Argentine republic -	Prohibited, except on deposite, when the value of wheat is less than $13 per bushel; beyond, admissible by license.
Austria - - -	19.21 cents per $123\frac{1}{2}$ pounds.
Belgium - -	(See duty on wheat.)
Bolivia - - -	5 per cent. on a valuation, and $\frac{1}{2}$ per cent. to the consulado.
Bermudas - -	72 cents per barrel of 196 pounds.
Brazil - - -	$48\frac{1}{2}$ per cent. on a valuation of $9 28 per barrel.
Central America -	10 per cent. on a fixed official valuation.
Chili - - -	Ranging from $2 to 50 cents per 101 pounds 12 ounces, according to the price of Chilian flour; free, if price of Chilian flour exceeds $7 per 101 pounds 12 ounces.
Denmark - -	75 cents per 100 pounds.
Sleswick & Holstein	$80\frac{3}{4}$ cents per 110.13 pounds.
France - - -	Ranging from 9 cents $3\frac{1}{2}$ mills per 220 pounds upwards, as the price of wheat diminishes in the French ports.
West Indies -	$3 45.95 per 220 pounds.
Great Britain* - -	Equal per barrel to the duty on $38\frac{1}{2}$ gallons of wheat, the duty on wheat being regulated by the average price each week, per quarter (8 bushels) in England.
West Indies -	96 cents per barrel.
American possess'ns	Nova Scotia, 48 cents per barrel. Newfoundland, 36 cents per barrel not exceeding 196 pounds in weight. New Brunswick, free.
Greece - - -	$\frac{1}{2}\frac{7}{5}\frac{1}{0}$ of a cent per quintal of 124 pounds 9 ounces 12 drachms.
Hayti - - -	$3 per barrel; 10 per cent. additional if carried in United States vessels.
Hanseatic cities - -	In Hamburg, $\frac{3}{8}$ per cent.; in Bremen, $\frac{2}{3}$ per cent.; in Lubec, $\frac{1}{2}$ per cent. ad valorem.
Italy - - -	75 cents to $1 50 per 640 Roman pounds, (about 492 pounds avoirdupois,) in proportion to the diminution of price of the home product in the ports of Italy.
Mexico - - -	Prohibited, except in the province of Yucatan.
Netherlands - -	$4 80 per 220 pounds, or about $4 25 per barrel.

* In all the British colonies, an imperial duty of 48 cents per barrel is to be added.

No. 25—Continued.

Countries.	Duties.
	FLOUR—Continued.
New Granada - -	In national vessels, $4 per barrel; in foreign vessels, 5 per cent. additional on the amount of duties.
Peru - - -	30 per cent. on a valuation.
Portugal - -	Ranging from 32.2 cents to $4 46.4 per alquiere of 3.07 gallons, as the market price of the home article diminishes.
Prussia - - -	$1 36.58 per Prussian cwt., or 113.381 pounds.
Russia - - -	64½ cents per bushel.
Spain - - -	Prohibited.
Cuba - -	In Spanish vessels, $9 per barrel; in foreign vessels, $10 per barrel. Additional, 1 per cent. "balanza."
Porto Rico - -	In national vessels, $3 50; in foreign vessels, $5 per barrel. Additional, 1 per cent. "balanza," ½ per cent. "consulado."
Sweden - - -	32 [illegible] cents per 225 pounds. Additional, convoy duty, 15 per cent. on the imports; town dues, 2½ per cent. on an official valuation.
Texas - - -	$1 per barrel.
Two Sicilies - -	$1 60 per 196 pounds, in foreign vessels; 80 cents per 196 pounds, in national vessels.
Turkey - - -	3 per cent. import duty; 2 per cent. (paid by importer) for privilege of selling.
Venezuela - -	$4 per barrel, with an additional 2 per cent. at Laguira, and 4 per cent. at other ports, on total amount of duties, and a further of 10 per cent. on the total amount.
	COTTON.
Argentine republic -	5 per cent. ad valorem.
Austria - -	80 cents per 123½ pounds.
Belgium - -	31 cents 7 mills per 220 pounds.
Bolivia - - -	5 per cent. on a valuation, and ½ per cent. the consulado.
Central America -	10 per cent. on a fixed official valuation.
Chili - - -	10 per cent. (uncleaned) on a valuation of $4 50 per 101 pounds 12 ounces; cleaned, 10 per cent. on a valuation of $8 per 101 pounds 12 ounces.
Denmark - -	Free.
Sleswick & Holstein	Free.
France - - -	$4 11.4 per 220 pounds.

No. 25—Continued.

Countries.	Duties.
	COTTON—Continued.
Great Britain - -	70 cents per 112 pounds.
American possessions	Free.
Greece - - -	Makou, $2 05½; second quality, $1 64.16 per 124 pounds 7 ounces 12 drachms.
Hanseatic cities -	In Hamburg, $\frac{3}{8}$ per cent.; in Bremen, $\frac{2}{3}$ per per cent.; in Lubec, $\frac{1}{2}$ per cent. ad valorem.
Italy - - -	20 cents per 112 Roman pounds, (77 pounds avoirdupois.)
Mexico - - -	Prohibited.
Netherlands - -	32 cents per 220 pounds.
New Granada - -	In national vessels, 12 per cent.; in foreign vessels, 17 per cent., on a home valuation.
Peru - - -	30 per cent. on a valuation.
Portugal - -	14.4 cents per 22 pounds.
Prussia - - -	Free.
Russia - - -	$18\frac{3}{4}$ cents per 36 pounds.
Spain - - -	Coming through the warehouses of Cuba and Porto Rico, under Spanish flag, $67\frac{1}{2}$ cents per 100 pounds, comprehending all duties; under foreign flag, $1 $12\frac{1}{2}$ per 100 pounds.
Cuba - -	Uncleaned, in Spanish vessels 20.21 per cent., in foreign vessels 28.01 per cent., on fixed value of $1 25 per 25 pounds 7 ounces; cleaned, same per centage on fixed value of $3 $37\frac{1}{2}$ per 25 pounds 7 ounces. Additional, 1 per cent. "balanza," and $\frac{1}{7}$ per cent. as war subsidy.
Porto Rico -	With seed, in national vessels 90 cents, in foreign vessels $1 30 per 101 pounds 12 ounces; cleaned, in national vessels $2 88, in foreign vessels $4 16, per 101 pounds 12 ounces. Additional, 1 per cent. "balanza," $\frac{1}{2}$ per cent. "consulado."
Sweden - -	$\frac{51}{125}$ of a cent per 15 ounces. Additional, convoy duty, 15 per cent. on the import; town dues, $2\frac{1}{2}$ per cent. on an official valuation.
Turkey - -	3 per cent. import duty; 2 per cent. (paid by importer) for privilege of selling.
Two Sicilies - -	$16 per cantaro of 196 pounds.
Venezuela - -	By the tariff of 1838, prohibited; the tariff of 1841 revokes the prohibition, but no duty is specified.

No. 25—Continued.

Countries.	Duties.
	BEEF.
Argentine republic	17 per cent. ad valorem.
Austria	$1 40 per 123½ pounds.
Belgium	$7 92.88 to $6 34.20 per 220 pounds (smoked.)
Bolivia	5 per cent. on [illegible] valuation, and ½ per cent. to the consula[illegible]
Brazil	20 per cent. [illegible] a valuation of $11 12.6 per barrel.
Central America	16 per cent. on a fixed official valuation.
Chili	30 per cent. on a valuation of $5 per 101¾ pounds.
Denmark	50 cents per 100 pounds salted, and $1 per 100 pounds smoked.
Sleswick & Holstein	55.54 cents per 110.13 pounds; smoked, $1 11.59 per 110.13 pounds.
France	$6 17 per 220 pounds.
West Indies	$1 87 per 220 pounds.
Great Britain*	$2 88 per cwt.
American possess'ns	Nova Scotia, $2 88 per cwt., 72 cents imperial duty. New Brunswick, free.
Bermuda	48 cents per cwt.
Greece	10 per cent. ad valorem.
Hayti	$2 per barrel; 10 per cent. additional in United States vessels.
Hanseatic cities	In Hamburg, ⅜ per cent.; in Bremen, ⅔ per cent.; in Lubec, ½ per cent.
Italy	$1 50 per 77 lbs.
Mexico	25 per cent on the invoice, and 25 per cent. added.
Netherlands	$3 20 per 220 lbs.
New Granada	$2 per 101¾ pounds, and 5 per cent. additional.
Peru	30 per cent. on a valuation.
Portugal	74.4 cents per 22 pounds.
Prussia	$1 36.58 per 113.381 pounds.
Russia	7 cents per pound.
Spain	$2 66⅔ per 25 pounds 7 ounces. Additional consumption duty, one-third the amount of tariff duty.
Cuba	35.08 per cent. on a fixed value of $9 per barrel. Additional, 1½ per cent.
Porto Rico	$1 60 per barrel. Additional, 1½ per cent.

* In all the British colonies, an imperial duty of 72 cents the cwt. is to be added.

No. 25—Continued.

Countries.	Duties.
	BEEF—Continued.
Sweden - -	$2 66.112 per barrel. Additional, 15 per cent. on the import town dues, 2⅓ on an official valuation.
Texas - - -	$3 per 200 pounds.
Turkey - -	3 per cent. import duty; 2 per cent. (paid by importer) for privilege of selling.
Two Sicilies - -	Free.
Venezuela - -	2 cents per pound; with an additional 2 per cent. at Laguira, and 4 per cent. at other ports, on total amount of duties; and a further addition of 10 per cent. on the total amount, under the law of July, 1841.
	PORK.
Argentine republic -	17 per cent. ad valorem.
Austria - - -	$1 40 per 123½ pounds.
Bermuda - -	48 cents per cwt.
Belgium - -	$3 16.95 per 220 pounds; smoked hams, $4 83.8 per 220 pounds.
Bolivia - - -	5 per cent. on a valuation, and ½ per cent. to the consulado.
Brazil - - -	20 per cent. on a valuation of $13 92 per barrel.
Chili - - -	30 per cent. on a valuation of $6 per 101¾ lbs.
Denmark - -	$1 per 100 pounds. Sleswick and Holstein, $1 11.59 per 110.13 pounds.
France - - -	$6 78.80 per 220 pounds. West Indies, $1 87 per 220 pounds.
Great Britain* - -	$2 88 per 112 pounds; hams and bacon, $6 72 per 112 lbs. American possessions, $2 88 per 112 pounds; hams and bacon the same. Canada, free.
Greece - - -	10 per cent. ad valorem; hams, &c., 5.13 cts. per 2 pounds 13 ounces.
Hayti - - -	$3 50 per barrel; 10 per cent. additional in United States vessels.
Hanseatic cities - -	In Hamburg, ⅜ per cent.; in Bremen, ⅔ per ct.; in Lubec, ½ per cent. ad valorem.
Italy - - -	$1 50 per 77 pounds.
Mexico - - -	Prohibited.
Netherlands - -	$3 20 per 220 pounds; hams smoked, $4 80; flitches, without hams or shoulders, $2 40 per 220 pounds.

* In all the British colonies an imperial duty of 96 cents per cwt. is to be added.

No. 25—Continued.

Countries.	Duties.
	PORK—Continued.
New Granada - -	\$3 per 101¾ pounds; 5 per cent. additional on amount of duties.
Peru - - -	30 per cent. on a valuation.
Portugal - -	\$1 48.8 per 22 pounds.
Prussia - - -	\$1 36.58 per 113.381 pounds.
Russia - - -	7 cents per pound.
Spain - - -	15 per cent. on a fixed value of \$2 per 25 lbs. 7 ounces. Additional consumption duty, one-third the amount of tariff duty.
Cuba - -	35.08 per cent. on a fixed value of \$14 per barrel; additional, $1\frac{1}{7}$ per cent.
Porto Rico - -	\$3 per barrel; 1½ per cent. additional.
Sweden - - -	53.056 cents per 18¾ pounds. Additional, 15 per cent. on the imports; town dues, $2\frac{1}{3}$ per cent. on an official valuation.
Texas - - -	\$3 per 200 pounds; bacon, 2 cents per pound.
Turkey - - -	3 per cent.; 2 per cent. (paid by importer) for privilege of selling.
Two Sicilies - -	Free.
Venezuela - -	2½ cents per pound, with an additional 2 per cent. at Laguira, and 4 per cent. at other ports, on the total amount of duties; and a further addition of 10 per cent. on the total amount, under the law of July, 1841.
	LARD.
Great Britain* - -	\$1 92 per cwt.
American possess'ns	Canada, \$1 44 per cwt.
	New Brunswick, \$1 92 per cwt.
	Nova Scotia, $\frac{4}{5}$ of 1 per cent., and 4 per cent. imperial duty
Bermuda - -	96 cents per cwt.
West Indies -	Jamaica, 72 cents per 70 pounds.
	Antigua, 96 cents per 100 pounds.
British Guiana -	1 cent per pound.
France - - -	\$2 05.70 per 220 pounds; colonies, the same.
Spain - - -	4 cents per pound.
Porto Rico - -	20 per ct. on a valuation of \$3 per 101¾ pounds.
Cuba - -	28.01 per cent. on a value of 62½ cents per 25 pounds 7 ounces.

* In all the British colonies, an imperial duty of 4 per cent. is to be added.

No. 25—Continued.

Countries.	Duties.
	BUTTER.
Great Britain* - -	$4 80 per cwt.
Bermuda - -	96 cents per cwt.
American possess'ns	Canada, 48 cents per cwt.
	New Brunswick, $2 per cwt.
	Newfoundland, 48 cents per cwt.
	Nova Scotia, $1 92 colonial duty, $1 92 imperial duty per cwt.
West Indies -	Antigua, $1 92 per cwt.
	Jamaica, 96 cents per 64 pounds.
British Guiana -	1 cent per pound.
France - - -	$1 02.87 per 220 pounds; in the colonies, prohibited.
Spain - - -	35 per cent. on a fixed value of 20 cents per 1 pound 4 drachms; additional consumption duty, one-fourth the amount of import duty.
Porto Rico - -	26 per cent. on a fixed valuation of $12 50 on 101¾ pounds.
Cuba - -	28.01 per cent. on a value of $3 75 per 25 pounds 7 ounces.
	CHEESE.
Great Britain† - -	$2 52 per cwt.
Bermuda - -	72 cents per cwt.
American possess'ns	Canada, 60 cents per cwt.
	Nova Scotia, 5 per cent. colonial duty, $1 20 per cwt. imperial duty.
West Indies -	Antigua, $1 20 per cwt.
	Jamaica, the same.
British Guiana -	5 cents per 10 pounds.
France - - -	$3 08.55 per 220 pounds; colonies prohibited.
Spain - - -	25 per cent. on a fixed valuation of $5 per 25 pounds 7 ounces; additional consumption duty, one-third the amount of import duty.
Porto Rico - -	26 per cent. on a valuation of $10 per 101¾ pounds.
Cuba - -	28 per cent. on a fixed value of $11 per 101¾ pounds.

* In all the British colonies, an imperial duty of $1 92 per cwt. is to be added.
† In all the British colonies, an imperial duty of $1 20 per cwt. is to be added.

No. 25—Continued.

Countries.	Duties.
	TALLOW.
Great Britain - -	76 cents per cwt.
American possess'ns	New Brunswick, for every £100 value, 10 per cent.
	Nova Scotia, $2\frac{1}{2}$ per cent.
France - - -	$2 05.70 per 220 pounds; colonies prohibited.
Spain - - -	15 per cent. on a fixed value of $2 per 25 pounds 7 ounces; additional consumption duty, one-third the amount of import duty.
Porto Rico - -	20 per cent. on a fixed value of $9 per $101\frac{3}{4}$ pounds.
Cuba - -	28.01 per cent. on a fixed value of $9 per $101\frac{3}{4}$ pounds.
	ASHES.
Argentine republic -	17 per cent. ad valorem.
Austria - - -	$\frac{20}{100}$ of a cent per $123\frac{1}{2}$ pounds.
Belgium - -	31 cents 7 mills per 220 pounds.
Bolivia - - -	5 per cent. on a valuation, and $\frac{1}{2}$ per cent. to the consulado.
Brazil - - -	20 per cent. on a fixed valuation.
Central America -	10 per cent. on a fixed official valuation.
Chili - - -	20 per cent. on a valuation.
Denmark - -	Free.
Sleswick& Holstein	Free.
France - - -	$3 08.56 per 220 pounds.
West Indies -	9 mills per 220 pounds.
Great Britain - -	$1 44 per cwt.
American possess'ns	New Brunswick, free.
	Nova Scotia, 4 per cent. imperial duty.
Greece - - -	10 per cent. ad valorem.
Hayti - - -	$1 per 221 pounds; 10 per cent. additional in United States vessels.
Hanseatic cities - -	In Hamburg, $\frac{3}{8}$ per cent.; in Bremen, $\frac{2}{3}$ per cent.; in Lubec, $\frac{1}{2}$ per cent. ad valorem.
Italy - - -	6 cents per 77 pounds.
Mexico - - -	20 per cent. on the invoice value, and 20 per cent. added thereon.
Netherlands - -	32 cents per 220 pounds.
New Granada - -	30 per cent. on a home valuation.
Peru - - -	30 per cent. on a valuation.
Portugal - -	49 cents 6 mills per 22 pounds.
Prussia - - -	17.07 cents per Prussian cwt. of 113.381 pounds.
Russia - - -	$2 53 per 360 pounds.

No. 25—Continued.

Countries.	Duties.
	ASHES—Continued.
Spain - - -	26$\frac{2}{3}$ per cent. on a fixed value of 15 cents per pound; additional consumption duty, one-third the amount of tariff duty.
Cuba - -	28.01 per cent. on a fixed value of $2 50 per 101 pounds 12 ounces; additional, $\frac{1}{7}$ per cent.
Porto Rico - -	50 cents per 101$\frac{3}{4}$ pounds; additional, 1$\frac{1}{2}$ per cent.
Sweden - - -	13.056 cents per 18$\frac{3}{4}$ pounds; additional, 7$\frac{1}{3}$ per cent. on an official valuation.
Texas - - -	15 per cent. ad valorem.
Turkey - - -	5 per cent.
Two Sicilies - -	$4 80 per cantaro of 196 pounds.
Venezuela - -	30 per cent. ad valorem, with an additional 2 per cent. at Laguira, and 4 per cent. at other ports, on total amount of duties; and a further addition of 10 per cent. on the total amount, under the law of July, 1841.

N. B.—Five per cent. must [illegible] added to the amount of duties in the table on imports into Great Britain from foreign nations, under the act 3 Vic., cap. 17, (May 15, 1840,) except on corn, which includes all sorts of grain, flour, meal, &c.

CANADA.

Table of customs duties, to be collected from and after November 16, 1843.

Articles.	Imperial duty.	Provincial duties.		Remarks.
	5 and 6 Victoria, chap. 49.	4 and 5 Victoria, chap. 14.	7 Victoria, chap. 1.	
Arms and ammunition, and utensils of war.	-	-	-	Prohibited.
Asses - - - -	Free -	Free -	5s. each -	See Mules.
Bacon and hams, cured -	3s. per cwt.	[illegible]	5s. per cwt.	
Barley, bear, or bigg - -	Free -	-	3s. pr. qr.	do.
Beans - - - -	Free -	Free -	3s. pr. qr.	If the fresh vegetable, 15 p. ct. under 7 Victoria, c. 1.
Beef, fresh - - -	Free -	Free -	4s. per cwt.	
salted - - -	3s. per cwt.	Free -	2s. per cwt.	
Biscuit or bread - -	Free -	5 per cent.		
Blubber, the produce of fish and creatures living in the sea, of foreign fishing.	15 per cent.	5 per cent.		
Books, such as are prohibited to be imported into the United Kingdom.		-	-	Prohibited.
Bran and shorts - -	Free -	Free -	3d. per cwt.	
Buckwheat - - -	Free -	Free -	3s. pr. qr.	
Bullion - - - -	Free -	5 per cent.		
Bulls - - - -	Free -	Free -	15s. each.	
Butter - - - -	8s. per cwt.	Free -	2s. per cwt.	
Calves, under one year old -	Free -	Free -	5s. each.	
Candles, other than spermaceti	7 per cent	5 per cent.		
Carriages of travellers -	Free.			
Cattle, neat, unenumerated, four years old.	Free -	Free -	£1 each.	
unenumerated, under 4 years old.	Free -	Free -	10s. each.	
Clocks and watches - -	7 per cent.	5 per cent.		
Cheese - - - -	5s. per cwt.	-	2s. 6d. p. cwt.	
Cocoa - - - -	1s. per cwt.	5 per cent.		
Coin - - - -	Free.			
Coin, base or counterfeit -	-	-	-	Prohibited.
Coffee, green - - -	5s. per cwt.	2d. per lb.		
ground - - -	5s. per cwt.	4d. per lb.		
roasted - -	5s. per cwt.	5 per cent.		
Colts and foals, under two years old.	Free -	Free -	15s. each.	
Cordage - - -	7 per cent.	5 per cent.		
Corks - - - -	7 per cent.	5 per cent.		
Corn and grain, unground -	Free -	Free -	According to the description specified in this act.	
Cotton manufactures - -	7 per cent.	5 per cent.		
Cotton wool - - -	Free -	5 per cent.		
Diamonds - - -	Free -	5 per cent.		
Drugs - - - -	Free -	5 per cent.		
Eggs - - - -	4 per cent.	-	10 per cent.	
Fins and skins, the produce of creatures living in the sea, of foreign taking.	15 per cent.	5 per cent.		

TABLE OF CUSTOMS DUTIES—Continued.

Articles.	Imperial duty.	Provincial duties.		Remarks.
	5 and 6 Victoria, chap. 49.	4 and 5 Victoria, chap. 14.	7 Victoria, chap. 1.	
Fish, fresh - - -	Free -	Free.		
of foreign taking or curing, dried or salted.	2s. per cwt.	Free.		
of foreign taking or curing, pickled.	4s. per bbl.	Free.		
Flax - - - -	Free -	5 per cent.		
Flour, wheat - - -	2s. pr. 196 lbs.	Free.		
Foals under two years old -	Free -	Free -	15s. each -	See Colts.
Fruit, fresh - - -	Free -	5 per cent.		
Game - - - -	–	–	–	See Poultry.
Geldings - - -	Free -	Free -	£1 10s. each	See Horses.
Glass manufactures - -	15 per cent.	5 per cent.		
Goats and kids - - -	Free -	Free -	1s. each.	
Grain, unground - -	Free -	Of all kinds free.	According to the description specified in this act.	See Corn & Gra[in]
Gums and resins - -	Free -	5 per cent.		
Gunpowder - - -	–	–	–	Prohibited.
Hams, cured - - -	3s. per cwt.	–	5s. per cwt.	See Bacon & Ha[ms]
Hardware - - -	7 per cent.	5 per cent.		
Hay - - - -	Free -	–	6s. per ton.	
Hemp - - - -	Free -	5 per cent.		
Herrings, taken and cured by the inhabitants of the Isle of Man, and imported from thence.	Free -	Free.		
Hides, raw - - -	Free -	5 per cent.		
Hogs - - - -	Free -	Free -	5s. each -	See Swine & Ho[gs]
Hops - - - -	4 per cent.	–	3d. per lb.	
Horses, mares, and geldings -	Free -	Free -	£1 10s. each.	
Indian corn - - -	Free -	Free -	3s. pr. qr.	See Maize or I[n]dian Corn.
Kids - - - -	Free -	Free -	1s. each -	See Goats & Ki[ds]
Lambs - - - -	Free -	Free -	1s. each.	
Leather manufactures - -	7 per cent.	5 per cent.		
Lard - - - -	4 per cent.	–	6s. per cwt.	
Linen manufactures - -	7 per cent.	5 per cent.		
Live stock - - -	Free -	Free -	According to the description specified in this act.	
Lumber - - -	Free -	5 per cent.	–	See Wood & Lu[m]ber.
Maize, or Indian corn - -	Free -	Free -	3s. per qr.	See Indian Corn.
Manures of all kinds - -	Free -	5 per cent.		
Mares - - - -	Free -	Free -	£1 10s. each	See Horses.
Meal, viz: Barley meal, wheat meal, (not being wheat flour,) oat meal, buckwheat meal, rye meal, and Indian corn meal.	Free -	–	2s. pr. 196 lbs.	
Meats, fresh - - -	Free -	–	4s. per cwt.	
salted - - -	3s. per cwt.	–	2s. per cwt.	
cured - - -	3s. per cwt.	–	2s. per cwt.	Except bacon an[d] hams.

TABLE OF CUSTOMS DUTIES—Continued.

Articles.	Imperial duty.	Provincial duties.		Remarks.
	5 and 6 Victoria, ch. 49.	4 and 5 Victoria, ch. 14.	7 Victoria, ch. 1.	
Molasses - - -	3s. per cwt.	1s. 6d. p. cwt.		
Mules and asses - -	Free -	Free -	5s. each.	
Oakum - - -	7 per cent.	5 per cent.		
Oats - - - -	Free -	–	2s. per qr.	
Oil, the produce of fish, and creatures living in the sea, of foreign fishing.	15 per cent.	Fish oil free.		
Packages containing dutiable articles.	Included in the value of the goods at port of entry.	Free.		
Paper manufactures - -	7 per cent.	5 per cent.		
Pease - - - -	Free -	Free -	3s. per qr. -	If the fresh vegetable, 15 per cent. under 7 Victoria, ch. 1.
Pork, fresh - - -	Free -	Free -	4s. per cwt.	
salted - - -	3s. per cwt.	Free -	2s. per cwt.	
Potatoes - - -	Free -	Free -	3d. per bush.	
Poultry or game, live - -	Free -	Free -	10 per cent.	
dead - -	4 per cent.	–		
Provisions and stores for the use of her Majesty's land and sea forces.	Free -	Free -	On agricultural produce and live stock the duties imposed by this act—7 Victoria, ch. 1.	Duties on cattle or live stock imported under contract entered into before October, 1843, to be returned.
Resins - - - -	Free -	5 per cent.	–	See Gums and Resins.
Rye - - - -	Free -	Free -	3s. per qr.	
Rice - - - -	Free -	5 per cent.		
Rum - - - -	*1s. per gal.	†6d. per gal.		
Salt - - - -	Free -	2s. 6d. pr barrel of 280 lbs		
Salt imported by sea - -	Free -	1s. per ton.		
Seeds - - - -	4 per cent.	Free.		
Settler's goods - - -	According to description of the articles.	Household, &c., free, (see sec. 11 of act.)		
Sheep - - - -	Free -	Free -	2s. each.	
Silk manufactures - -	15 per cent.	5 per cent.		
Shorts - - - -	Free -	–	3d. per cwt.	See Bran & Shorts.
Skins, fish - - -	–	–	–	See Fins and Skins.
Soap - - - -	7 per cent.	5 per cent.		
Spermaceti - - -	15 per cent.	5 per cent.		
Spirits and cordials, except rum	*1s. 6d. p. gal.	†Not sweetened, 6d. per gal.; sweetened, 1s. 7d. per gallon.		
Stores and provisions for her Majesty's forces.	Free -	Free -	–	See Provisions and Stores, &c.
Straw - - - -	Free -	–	3s. per ton.	

* See section 10 of imperial act.
† For excess over proof, &c., see schedule of provincial act.

TABLE OF CUSTOMS DUTIES—Continued.

Articles.	Imperial duty.	Provincial duties.		Remarks.
	5 and 6 Victoria, ch. 49.	4 and 5 Victoria, ch. 14.	7 Victoria, ch. 1.	
Sugar, refined, the produce of, and refined in, foreign countries.	20 per cent.	2d. per lb.		
unrefined - -	5s. per cwt.	1d. per lb.		
Sirups - - - - -	4 per cent.	1s. 6d. p. cwt.		
Swine and hogs - -	Free -	Free -	5s. each.	
Tallow - - - - -	Free -	5 per cent.		
Tea, unless imported directly from China, or unless imported from the United Kingdom, or from any of the British possessions.	1d. per lb. -	3d. per lb.		
Tobacco, manufactured -	7 per cent.	2d. per lb.		
unmanufactured -	4 per cent.	1d. per lb.		
Tortoise shell - - - -	Free -	5 per cent.		
Tow - - - - -	Free -	5 per cent.		
Vegetables, except potatoes -	Fresh, free	-	Unenumerated, 15 per ct.	
Watches - - - -	7 per cent.	5 per cent.	-	See Clocks and Watches.
Wheat - - - - -	Free -	Free -	3s. per qr., Provinc'l act, 6 Victoria, ch. 31, Aug. 10, 1843.	
Wine, whether bottled or not—				
Madeira - - -	7 per cent.	1s. per gal.		
Other wines - -	7 per cent.	6d. per gal.		
Wood and lumber - -	Free -	5 per cent.		
Woollen manufactures -	7 per cent.	5 per cent.		
All other articles not enumerated or included under any of the foregoing heads.	4 per cent.	5 per cent.		

N. B.—The *ad valorem* duties under the imperial act 5 and 6 Victoria, chapter 49, are to be calculated on the value at the port of entry; which value is generally to be ascertained by adding 10 per cent. to the invoice price.

The *ad valorem* duties under the provincial act 4 and 5 Victoria, chapter 14, are to be calculated on the actual cost of the articles where purchased.

The *ad valorem* duties under the provincial act 7 Victoria, chapter 1, (continued until the 5th of January, 1845,) viz: on eggs, poultry, game, and vegetables, on the value at the place of importation.

Specific duties are to be taken in sterling, at the rate of £1 4*s*. 4*d*. currency to the pound sterling.

The duties specified in the foregoing table (imperial and provincial) are to be levied in addition to each other.

NOTE.—To bring the shillings *sterling* into federal currency, (estimating the pound at $4 80, which is the standard by act of Congress,) multiply the shillings by 24, which will bring the sum into cents—24 by 20—$4 80.

No. 26.

BILLS OF SALES OF AMERICAN PRODUCE IN ENGLAND.

'ales 42 tierces beef, by Geo. W. Atwood, No. 1 London street, Mark lane, London.

Sold at 90 days:			
9 tcs. navy mess beef, 304 lbs., in bond, at 78*s.* 9*d.*		£153 11 3	
3 " India " " 336 lbs., " at 90*s.*		13 10 0	
			£167 1 3
Charges.			
ısurance from New York to London - -		£2 6 3	
'reight 42 tcs., at 4*s.* - - -	£8 8 0		
Primage 5 per cent. - -	8 5		
		8 16 5	
,anding, wharfage, housing, &c., at 10*d.* -	1 15 0		
)pening for inspection - - -	10 6		
weeks' rent, at ½*d.* per week - -	7 0		
	3 12 6		
Discount at 10 per cent. - -	7 4		
		3 5 2	
'0 days' interest on above charges, at 5 per cent.		2 9	
Commission on £167 1*s.* 3*d.*, at 5 per cent. - -		8 7 2	
			22 17 9
Net proceeds - - - -			£144 3 6

London, 1843.

E. & O. E.

GEORGE W. ATWOOD.

Pro forma of sales of 100 tierces mess beef, sold for cash, at 1¼ per cent. discount. London, 1843.

100 tierces mess beef, in bond, at 80*s.*	£400 0 0	
Less discount 1¼ per cent. - -	5 0 0	
		£395 0 0
Charges.		
Freight, 6*s.* 6*d.*; primage, 5 per cent., and insurance - - - - -	36 17 7	
Custom-house, 7*s.*; fire insurance, 5*s.* - -	12 0	
Landing, lighterage, wharfage, weighing, &c. -	2 17 6	
Coopering, opening for inspection, rent, &c. -	2 10 0	
Commissions, (including brokerage) 5 per cent.	20 0 0	
		62 17 1
Net proceeds - - -		£332 2 11

At 8 per cent. exchange, $1,593 82, or $15 93 per tierce.

Pro-forma of sales of 100 *barrels prime mess pork in bond, sold for cash* 1¼ *per cent. discount. London*, 1843.

100 barrels prime mess pork, at 43*s*. - -	£225 0 0	
Less 1¼ per cent. discount - - -	2 16 3	
		£222 3 9
Charges.		
Freight, 3*s*.; primage, 5 per cent.; insurance, 1 per cent. - - - - -	18 0 0	
Custom-house expenses, 7*s*.; fire insurance, 3*s*.	10 0	
Landing, lighterage, wharfage, housing, &c. -	1 17 6	
Coopering, pickling, opening for inspection, rent, &c. - - - - - -	2 0 0	
Commissions and guarantee (including brokerage) 5 per cent. - - - -	11 5 0	
		33 12 6
Net proceeds - - -		£138 11 3

At 8 per cent. exchange, $905 10, or $9 05 per barrel.

Pro-forma of sales of 100 *tierces India pork, sold for cash, at* 1¼ *per cent. discount. London*, 1843.

100 tierces India pork, in bond; 318 lbs. each, at 87*s*. 6*d*. - - - - - -		£437 10 0
Less discount 1¼ per cent. - - - -		5 9 3
		432 0 9
Charges.		
Freight, 6*s*. 6*d*.; primage, 5 per cent.; insurance	£36 17 7	
Custom-house, 7*s*.; fire insurance, 5*s*. - -	12 0	
Landing, lighterage, wharfage, housing, &c. -	2 17 6	
Coopering and pickling, opening, rent, &c. -	2 10 0	
Commissions, guarantee, brokerage, &c. -	21 17 0	
		64 14 1
Net proceeds - - -		£367 6 8

At 8 per cent. exchange, $1,763 20, or $17 63 per tierce.

Pro forma of sales of 10 *tons lard, cash* 2½ *per cent. discount. London,* 1843.

10 tons net, duty paid, at 39*s.* per cwt. - -	£390	0	0			
Less 2½ per cent. discount -	9	15	0			
				£380	5	0

Charges.

Freight 30*s.*; primage 5 per cent.; insurance 1 per cent. - - - - -	£19	13	0			
Duty 2*s.* and 5 per cent. added, 420*s.*; entries 5*s.*	21	5	0			
Wharfage, weighing, turning out, public sales, &c.	2	10	0			
Commission and guaranty (including brokerage)	19	0	0			
				62	8	0
Net proceeds - - - - -				£317	17	0

At 8 per cent. exchange, $1,525 68.

Pro forma of sales of 20 *tons North American melted tallow.*

20 tons net, at 44*s.* per cwt. - - -	£880	0	0			
Less discount, 2½ per cent. -	22	0	0			
				£858	0	0

Charges.

Freight 35*s.*; primage 5 per cent.; insurance 1 per cent. - - - - -	£45	6	8			
Duty 3*s.* 2*d.* per cwt., and 5 per cent. added -	66	10	0			
Custom-house entries - - - - -		5	0			
Wharfage, weighing, turning out, coopering, public sales, expenses, &c. - - - -	5	0	0			
Commission and guaranty, (including brokerage,) 5 per cent. - - - - -	44	0	0			
				161	1	8
Net proceeds - - - - -				£696	18	4

At 8 per cent. exchange, $3,345 30; or, $8 36 per cwt.

Sales of 32 *casks good American butter, by George W. Atwood, No.* 1 *London street, Mark lane, London.*

	cwt.	qr.	lbs.				
Sold at 60 days 32 casks butter—							
Weighing gross - -	28	3	14				
Tare, 19 lbs. each - -	5	1	20				
	23	1	22	at 60*s.* per cwt.	£70	6	9

Charges.

	cwt. qrs. lbs.		
Paid duty on landing, weight gross	29 1 0		
Tare	5 1 20		
	23 3 8 at 20*s*. per cwt.		£23 16 5
Paid 5 per cent. additional			1 3 10
Paid freight on 29 cwt. 1 qr., at 35*s*. per ton		£2 11 2	
Primage, 5 per cent.		2 6	
			2 13 8
Landing, charges, and weighing, 7*d*. per cask		18 8	
Rent for 10 weeks, at 5*far*.—100 casks per week		16 0	
		1 14 8	
Less discount, 10 per cent.		3 6	
			1 11 2
Bill stamp 3*s*. 6*d*.; warehousing and duty paid entry, 5*s*.			8 6
Fire insurance			2 9
Interest on the above charges, 61 days, at 5 per cent.			5 0
Commission on £70 6*s*. 9*d*. at 5 per cent.			3 10 4
Total charges			33 11 8
Amount of sales			70 6 9
Net proceeds			£36 15 1

London, 1843. E. & O. E.

GEORGE W. ATWOOD.

Pro-forma of sales of 500 *casks grease butter, sold at* 2 *months' discount—in bond. London*, 1843.

	cwt. qrs. lbs.			
500 casks	460 0 0			
Tare	76 0 0			
		384 cwt. net, at 32*s*.	£614 8 0	
		Less discount, 2 months	5 2 0	
				£609 6 0

Charges.

Freight 35*s*.; primage 5 per cent.; insurance 1 per cent.	£48 8 3	
Custom house 3*s*. 6*d*.; fire insurance 10*s*.	13 6	
Lading, wharfage, weighing, &c.	15 0 0	
Commission and guaranty, (including brokerage,) 5 per cent.	30 14 0	
		94 15 9
Net proceeds		£514 10 3

At 8 per cent. exchange, $2,468 34.

Sales of 121 *packages of grease butter, by Geo. W. Atwood, No.* 1 *London street, Mark lane, London.*

	cwt.	qrs.	lbs.				
Sold at 90 days, 121 kegs butter	116	3	4				
Tare - - -	18	3	25				
	97	3	7	at 34*s*. in bond	£166	5	8

Charges.

Paid freight and primage on 5 tons 18 cwt., at at 30*s*. - - -	£9	5	10			
Bonding entry, and clearance warrant -		5	6			
Fire insurance, 4*s*. 6*d*.; marine insurance, £1 10 6 - - - - -	1	15	0			
Stamp duty, 5*s*.; postages, 4*s*. - - -		9	0			
Landing, weighing, and re-weighing, tarring, cooperage, warehouse rent, and delivery -	3	6	4			
Interest on cash charges, 3 months 5 days, at 6 per cent. - - - - -		4	9			
Commissions on £166 5 8, at 5 per cent. -	8	6	4			
				23	12	9
Net proceeds - - - - -				£142	12	11

E. & O. E.

London, 1843. GEORGE W. ATWOOD.

Sales of 500 *boxes of cheese by George W. Atwood, No.* 1 *London street, Mark lane, London.*

	Cwt.	qrs.	lbs.				
Sold at 60 days 500 boxes cheese, weighing	166	2	12				
Deduct 1 lb. primage for every 3 cwt. -		2	0				
	166	0	12	at 45*s*.	£373	14	10

Charges.

Paid freight and primage as per bill of lading on 10 tons 1 cwt. 2 qrs., at 25*s*. per ton, gross -	£13	5	10			
Paid duty entry on 166 cwt. 3 qrs. 11 lbs., at 10*s*. 6*d*. per cwt., and 5 per cent. additional -	92	6	6			
Landing, charges, weighing, opening, sampling, and weighing - - - -	4	19	0			
Paid 3 weeks' warehouse rent - - -	1	1	1			
Paid stamp duty 5*s*.; postages 6*s*. 4*d*. - -		11	4			
Paid fire insurance - - - -		9	6			
Interest, 65 days, on cash charges above -	1	3	4			
Commission on £373 14*s*. 10*d*., at 5 per cent. -	18	13	9			
				132	10	4
Net proceeds - - - - -				£241	4	6

E. & O. E.

London, 1843. GEORGE W. ATWOOD.

Sales of 100 *barrels of flour, by George W. Atwood, No.* 1 *London street, Mark lane, London.*

Sold at 60 days, 100 barrels flour, in bond, at 28*s*. - - - - - - -		£115 0 0
Charges.		
Paid freight, as per bill of lading, on 100 barrels at 3*s*. - - - - - -	£15 0 0	
Primage on freight, at 5 per cent. - -	15 0	
Landing, wharfage, weighing, and shipping 100 barrels flour, 192 cwt. 3 qrs. 2 lbs., at 3*s*. 6*d*. per ton - - - - - -	1 13 9	
Coopering 100 barrels at 2*d*. each - -	16 8	
Lighterage on board Regalia for Barbadoes -	1 5 0	
Paid for bonding entry - - -	15 0	
Factorage on 100 barrels, at 6*d*. each - -	2 10 0	
Del credere, 1 per cent. - - -	1 3 0	
Commissions on £115, at 5 per cent. - -	5 15 0	
		27 13 5
Net proceeds - - -		£87 6 7

E. & O. E.

GEORGE W. ATWOOD.

London, 1843.

Rates of freight from New York to Liverpool, January 26, 1844.

Beef, in tierces - - - - -	6*s*. *a* 7*s*. per tierce.
in barrels - - - - -	3*s*. *a* 3*s*. 6*d*. per bbl.
Pork, in barrels - - - - -	3*s*. *a* 3*s*. 6*d*. per bbl.
Butter and cheese - - - - -	40*s*. per ton.
Lard and tallow - - - - -	30*s*. *a* 35*s*. per ton.

The above are the rates in British sterling, with 5 per cent. primage added.

No. 27.

The following extract from a report lately made to the Legislature of Canada, will be interesting, as showing the preference of shipment to England, via New York, and other ports in the United States.

Freight and charges on one barrel of flour from Cleveland to Liverpool, via Montreal.

	s.	d.
Cost of barrel and coopering - - - - -	1	10½
Freight from Cleveland to Kingston - - - -	1	0½
Freight from Kingston to Montreal - - - -	2	0

	s.	d.
Insurance from Kingston to Montreal	0	2
Shipping at Montreal	0	6
Coopering at Montreal	0	2
	6	7
Charges to and in Liverpool, as per accompanying account sales	7	11
	1	6

Pro forma account sales of 1,000 barrels Canadian flour in Liverpool, by Gibb, Bright, & Co., sold within 3 months after the arrival, payment 3 months—1,000 barrels, at 28*s.* per barrel				£1,400	0	0
Charges.						
Insurance on £1,150, at 40*s.* per cent., policy 6*s.*	£26	12	0			
Town and dock dues	11	9	2			
Duty on 1,000 barrels, at 7*d.* 7—32	30	1	6			
Freight 3*s.* per barrel, primage 5 per cent.	157	10	0			
Cartage, porterage, and cooperage, 7¼*d.*	30	4	2			
Storage 3 months, and ⅙ of a penny per barrel per week	9	0	6			
Insurance from fire, 7 per cent.	4	18	0			
Interest on duties, £41 10*s.* 8*d.*, 6 months	1	1	0			
Interest on freight, £157 10*s.*, 3 months	1	19	6			
Bank commission on £41 10*s.* 8*d.*, ¼ per cent.		2	1			
Commission and del credere on £1,400, at 4 per cent.	56	0	0			
				328	17	11
Net proceeds				£1,071	2	1

*Statement of charges on a barrel of flour (*196 *pounds) from Cleveland to Liverpool.*

	s.	d.	s.	d.	s.	d.
Via Montreal—						
Freight to St. Catherine's					1	3
Freight to Liverpool					14	6
					15	9
Via New York—						
Barrel-lining, nailing, &c.	1	10½				
Freight to Buffalo		7½				
Storage and shipping		3½				
Freight to New York	3	1½				
Cooperage 2*d*, insurance 2*d*	1	4				
			6	3		

		s. d.	
Brought over		6 3	
	s. d.		
Shipping charges	3		
Freight to Liverpool	1 6		
Charges in Liverpool per No. 4, less insurance	2 9		
Insurance 1 per cent. on 30*s.*	4		
Interest on disbursements	3		
Four months' interest on 20*s.* original cost	3½	*s. d.*	
		5 4½	*s. d.*
			11 7½
Gain in favor of New York			3 1½

No. 28.

Table of imports of produce from January 1 to November 10, 1843.

Imports.	Pork.		Beef.			Lard.		Tallow.		Cheese.		Flour.	Sperm oil.	Whale oil.
	Tierces.	Barrels.	Tierces.	Barrels.	Half barrels.	Barrels.	Kegs.	Hhds.	Barrels.	Casks.	Boxes.	Bbls.	Casks.	Casks.
American - -	1,168	1,540	3,909	631	111	4,171	8,727	1,412	662	2,114	22,013	8,698	1,990	2,122
Hamburg and Baltic -	269	981	3,052	353	-	Not	kept.	57,700	casks.					
Irish - - -	25,216	17,777	11,613	4,381	62	Not	kept.	Not	kept.					
Total - -	26,653	20,298	18,574	5,655	173	4,171	8,727	59,112	662	2,114	22,013	8,698	1,990	2,122

PREPARATION OF PROVISIONS FOR BRITISH MARKETS.

Remarks on American produce appended to the foregoing table.

Beef.—Duty 8*s*. per cwt. (112 pounds) from the United States, and 2*s*. per cwt. from British possessions. The importations of this article from the United States since the first of January have been about 4,000 tierces, 530 barrels, and 75 half-barrels; much of which has been exceedingly well liked, and met with a ready sale, at remunerating prices to the shippers. It should be remarked, however, that a considerable quantity has come forward which had not had proper attention paid to the cutting, packing, salting, and curing, which has met with very dull sale, and poor encouragement to the shipper to continue consignments of this article to this market. Some ten or fifteen hundred tierces of this character are yet on the market, and for which it is impossible to find buyers even at very low and sacrificing prices. It is to be sincerely hoped that future shipments coming forward will have the most careful attention paid to the manner of getting them up. Beef intended for this market (London) should be handsomely cut into 8lb. pieces, and packed in new tierces made with neatness and care as to the proper size to contain the quantity of meat intended. The knife and saw are very essential implements, and should be extensively used in making up beef for this market. A tierce of India beef should be made from the best pieces; each tierce should contain 42 pieces of 8 pounds each, (336 pounds,) and be neatly branded with a marking plate—"42 pieces (336 pounds) prime India beef." A tierce of prime mess beef should contain 38 pieces of 8 pounds each, (304 pounds,) and be branded in like manner—"38 pieces (304 pounds) prime mess beef." Great care should be also taken to have it handsomely packed, with a great abundance of salt throughout the cask, adding two or three ounces of saltpetre in each cask, with the very essential requisite of a heavy capping of salt on the top, and a clear, strong, and fine pickle. I repeat, these things must be strictly observed before shipping, as it is wholly requisite to their ready sale. And if they have to be done after the beef gets here, the expense of doing it is fully double the cost at home, besides injury to the character of the article in market, and detention of sale. The article has now assumed better prospects and prices than in my advices of the 1st ultimo; and we are pleased to be able to quote a ready demand for it at from 95*s*. to 100*s*. per tierce of 336 pounds of prime India beef, and prime mess beef in tierces of 304 pounds from 75*s* to 80*s*., in bond.

I would strongly recommend curing from eight to ten days in vats or hogsheads, with plenty of salt or pickle, until the blood is thoroughly extracted from it; then each piece should be taken out, washed and trimmed, and neatly packed in tierces—remembering the very essential heavy capping of salt on top, when it should be headed up, and a new, bright clear pickle should be put upon it. The tierces should be full hooped, with an addition of six hoops of iron—one on each bilge, quarter, and chime; if very strong heavy iron, four hoops will answer—one on each bilge and chime. I would also add, that I do not consider it essential that the ham should be cut and used in making beef for this market, where it can be more advantageously used for smoking purposes at home.

Pork.—The duty is the same for pork as beef. Prices of this article yet rate low. Market heavily stocked, and prospects of a new supply from Ireland being large, I would recommend caution against packing for this mar-

ket in anticipation of large prices. I, however, look for some recovery from the present very low prices, which I quote as dull at from 40*s.* to 45*s.* per barrel of prime mess pork, (200 pounds,) and at from 70*s.* to 75*s.* per tierce of prime India pork (318 pounds) in bond. The imports of this article from the United States this year, since January 1, 1843, have been small—say about 1,100 tierces, and 1,200 barrels; but little of which has been well adapted in its cut and cure for this market, and, consequently, has had to be sold at prices much less than my quotations, and at a great sacrifice to shippers. I would also state briefly the mode of putting up pork.

First, cut off the head, then halve the middle in the same way, (lengthwise of the hog,) weigh the strips separately, dividing the weight by four or six pounds, as you may determine to make India or prime mess. Prime mess is put up in barrels of 50 pieces, of 4 pounds each, (200 pounds,) and made from hogs weighing from 160 to 200 pounds. India pork is put up in tierces containing 53 pieces of 6 pounds each, (318 pounds,) and made from hogs well fatted, weighing from 225 to 300 pounds, (not exceeding the latter,) and in every other way like prime mess. Pork too heavy and fat would not suit. The necks, if put in at all, should have all the bone taken out, to give them the appearance of middle pieces. Add 1½ ounce of saltpetre to each barrel, and 2 ounces to each tierce.

The Irish cut up the ham and shoulder into the lot; but this is not important. All the fag-ends and ill-shaped pieces must be reserved and rendered up into lard. No attempt to work in a few coarse pieces must be made, as it is sure to be *detected.* A tierce of India pork should be marked "53 pieces (318 lbs.) prime India pork." A barrel of prime mess pork should be marked "50 pieces (200 lbs.) prime mess pork." Each tierce should have two iron hoops on each end, and barrels one—same as beef. Full-hooped packages, made in the neatest manner possible, and only sufficiently large to contain (closely packed) either the beef or pork. A 41 or 42 gallon tierce will be found large enough for a tierce of prime mess beef of 304 lbs. The Irish rub with fine salt each piece, and pack in hogsheads or vats for some time, (6 or 8 days,) the same as beef, generally without pickle.

Anything that is done in provisions for the English market must be done *nicely;* too much care cannot be taken. Low prices also must be looked for; and, unless it can be well done here at a low figure, it cannot be advised.

My present quotations are a very low price for provisions in England.

Hams.—Smoked or in pickle, duty 14*s.* per cwt. United States, and 3*s.* 6*d.* British possessions. Some good have come forward in dry salt, and been smoked here, which brought 60*s.* per cwt., duty paid. But most that have arrived, have not had proper care in the curing and drying before shipment. The very great degree of neatness, and uniform excellence of cure and flavor of the English hams, will continue to retain for them the preference at a much higher price, until the greatest care and pains are taken in their cure and packing in the United States. They are inquired for in bond for ships' use, and something really good would bring 50*s.* to 55*s.*, duty paid.

Tongues.—Duty 10*s.* per cwt. United States, and 2*s.* 6*d.* British possessions. Should be packed in kegs of 12 each. I quote them at 2*s.* to 3*s.* each, according to size and quality. Often wanted in bond, for ships' use.

Lard.—Duty 2*s.* per cwt. United States, and 6*d.* British possessions. I have now to notice a falling off in price of about 2*s.* per cwt. since my last advices. The recent large public sales of this article at Liverpool have called the attention of purchasers to market, and they succeeded in supplying their wants therefrom at 35*s.* 6*d.* to 36*s.* 6*d.* per cwt. Very few transactions of note

have been made in this market during the past three weeks, and my quotations are rather nominal at 35*s.* 6*d.* to 37*s.* 6*d.*, per cwt., duty paid, in barrels. Kegs are yet wanted, in small quantities, at 39*s.* to 40*s.*, duty paid. I am, however, offered 38*s.* 6*d.* for a small invoice of barrels ex Victoria, not landed, providing the quality meets my expectations when landed, as I am advised by the shipper that the quality is very fine. I look for a recovery in the price of this article, on the ground that it is mostly used for manufacturing purposes; and that, as we have recently had an improvement in buoyancy and price in our tallow market, a recovery in lard is almost inevitable.

Tallow.—Duty 3*s.* 2*d.* per cwt. United States, and 3*d.* British possessions. I am pleased to notice an improvement in price and demand in this article since last advices; the demand is active at 42*s.* to 43*s.* per cwt., with favorable prospects.

Butter.—Duty 20*s.* per cwt. United States, and 5*s.* British possessions. The really fine qualities of Dutch are in good demand at 88*s.* to 92*s.* per cwt., with a fair prospect of improvement by Christmas. It is yet doubtful whether United States butter of the finer qualities can arrive here after so long a voyage, and with so varied a cargo as our packet-ships usually bring, and yet retain its excellence of flavor, and not become strong. Should the better qualities of Ohio not exceed 6 cents in value, shipments of this article would not be unsafe, as we look for an export demand, as well as home consumption, at remunerating prices from this cost. Grease butter is now out of season, and prices nominal at 30*s.* to 34*s.* in bond, duty 1*s.* 8*d.* per cwt.

SPERM OILS AND HEAD MATTER.

Oils.—Duty, £15 per tun of 252 gallons, imperial measure. An English imperial gallon is said to contain about one-fifth more than the United States standard gallon. I quote a healthy market at £72 to £73 per tun for American caught (or the sperm.)

Southern oil.—Duty £6 per tun. Our stock is light, and we have ready sales at £36 10*s.* to £37 for pale, and £34 to £36 for *brown* and *yellow.* Caution should be exercised, as these prices are high; nevertheless I do not anticipate any reduction before March or April next.

Lard oil and stearine.—Duty 20 per cent. ad valorem. This article has not become sufficiently known here to bring its value. Hence I cannot recommend shipments at present.

Cod and liver oil.—Duty £6 per ton. The recent supplies from Newfoundland are large, and prices lower—say dull at £33 to £34 per tun, duty paid.

Whale fins.—Duty 20 per cent. ad valorem. These are scarce; the ordinary descriptions of southern, £290 to £295 per tun; and northwestern, £275 to £280 per tun. Prospect of sustaining prices until spring, when supplies are expected from the colonies, when a considerable reduction may be looked for.

Cheese.—Duty 10*s.* 6*d.* per cwt. United States, and 5*s.* per cwt. from British possessions. The extremes of this article, in order, are 42*s.* to 54*s.* per cwt. The aspect of our market is again more healthy, in consequence of the quantity coming forward being lessened. The demand is not, however, equal to the diminished supply. My quotations embrace small, smooth, fair quality Ohio, and the very best Herkimer county dairies, both in boxes. There is considerable damaged and inferior on the markets,

which is selling at slow rates, at all prices varying from 20*s.* to 36*s* per cwt., according to value. Enough care has not been taken by even the most judicious shippers in getting this article here in good condition. There has been scarcely a lot arrived here this season, that has come to hand in perfect order; all have received more or less injury, although the recent arrivals have come in much better order than former shipments. Shippers should order stronger boxes for another season—even stronger than the usual strong boxes made in Herkimer county. I am pleased to notice that American cheese is getting into increased favor here, although the demand is comparatively small, so as not to exceed one third or one fourth of the cheesemongers out of this vast metropolis; and, probably, not above one in twenty in the country have tried the experiment of their sale. Our fine qualities are greatly admired by those who have used them; and, with a proper degree of care in the shipments from the United States, we may expect soon a good demand, at remunerating prices, for the entire surplus of American make. We are at present contending against prejudices that are strong, as they are kept alive from every motive of interest, as well as otherwise. The bad condition of the early arrivals tended greatly to strengthen them. I would again strongly recommend that the make, in future, should be much thicker, and that it should be *very slightly* colored in the curd; but is better not to be colored at all, than to be colored as much as some of that known among you as imitation English cheese, which does not meet with a ready sale in this market. A strong effort has been recently made, in consequence of the accumulating supply of American cheese, as well as other provisions, to introduce the sale by auction, in hopes that it would have the effect of becoming in more general use, as well as clearing the market from rubbish which must eventually go at low prices, as it daily deteriorates in quality, quantity, and value. This effect, I regret to say, did not prove successful; although it may have been for want of its being made sufficiently attractive, as the lots offered, with some very few exceptions, were tail pieces damaged, and inferior lots.

This method of sale is strongly opposed by the wholesale traders and brokers in the metropolis, as their fears have been aroused that the trade may be changed into different channels, and, in consequence, innovations made on their usual profits. Whether other and more attractive efforts will be made, is yet undecided, though there is a strong feeling towards such a plan.

Clover seed.—Duty 10*s.* per cwt. United States, and 5*s.* per cwt. from British possessions. Season of sale, February and March. Prices are yet nominal; good would, however, be taken on speculation at 45*s.* to 50*s.* per cwt., in bond. I anticipate better prices, as the crop here is only middling; yet, it should be borne in mind that these are only conjectures, and, even when made by the wisest heads, are not always realized.

Linseed.—Duty 1*s.* per quarter of 8 bushels; prices are yet low, as there is no other demand, save for crushing and feeding purposes. I quote poor crushing 33*s.* to 38*s.*, and good feeding 40*s.* to 42*s.* per quarter. The prices of the United States tierce seed, for sowing purposes, are yet nominal at 60*s.* to 65*s.* per tierce. Season of sale, March and April. Shipments of this article should be made to Liverpool, because of its contiguity to market in Ireland, or else direct to Ireland. Londonderry, Newry, and Belfast, are good markets; and consignments to me at any of the above places will

have every needful attention, bills of lading being forwarded to me at London.

Linseed cakes.—Duty 1*s.* per ton. The demand is now good at £6 to £7 10*s.* per ton, American. Thin oblong cakes are of more ready sale at my highest quotation.

Beeswax.—Duty 2*s.* per cwt. United States, and 1*s.* per cwt. British possessions. I am enabled to raise my quotations since last advices to £8 10*s.* and £9 per cwt. for good, unadulterated. If in any degree bleached, the duty is 20*s.* per cwt.

Hides.—Duty on dry 6*d.*, and on wet 3*d.* per cwt. United States, and 2*d.* and 1*d.* from British possessions. Prices have slightly improved. I quote 6½*d.* to 7½*d.* for dry, and 3¾*d.* and 4*d.* for wet, per pound.

Cotton.—The printed reports will afford you more ample information of prices than I have room for here. Liverpool is, of course, the great market for it; but small shipments, of judicious selection, often meet with more ready sale and better prices here than there, particularly if the shipments directly from the United States to the north of Europe are not large. The quality adapted to this market is good to fair Georgia, and is sold for *exportation.* It should (for London) be free from admixture of blue balls, &c., and in square (not round) bales. The Liverpool quotations are duty paid; here they are given in bond, duty $\frac{5}{16}$ of 1*d.* per lb., or 2*s.* 11*d.* per cwt. The terms of credit given to buyers here differ from those of Liverpool: here, 1 month; in Liverpool, 1 month and 10 days.

Tobacco.—Duty 3*s.* per lb. London is the chief market for this article; for prices, see printed reports, quotations for which are in bond. It would also be well to examine the British tariff in relation to restrictions, &c. The duty on manufactured tobacco is nearly equal to a prohibition. The allowance in weight by the customs is large—say 38 lbs. per hogshead for draught and shrinkage, and nearly 4 per cent. for tret.

Turpentine.—Raw, duty 1*d.* per cwt.; price 7*s.* 6*d.* to 7*s.* 9*d.* per cwt. The supply is light yet, and but little remains in importers' hands. The last sale for good was at 7*s.* 6*d.* per cwt.: prospect for sustaining prices, good.

N. B.—All the foregoing articles are subject to an additional of 5 per cent. on the amount of duty named.

Flour.—Duty this week (December 2, 1843) 11*s.* 5½*d.* per bbl., and 19*s.* per quarter (8 bushels) on wheat. The stock of flour in bond is very small, yet the demand is very limited at 23*s.* per bbl. There is no wheat in bond at present. I quote best Dantzic (duty paid) at 60*s.* to 62*s.* per quarter. The 5 per cent. before spoken of does not apply to grain, flour, &c.

Business generally.—I am pleased to notice a general improvement in trade throughout the whole kingdom, and a gradual recovery from its long depressed condition, with a prospect of its continuance; and that the consumption of many articles of produce is greatly increased. In some districts it is said that the article of flour alone has increased 35 to 45 per cent. above corresponding months last year. It is also the opinion of many of the most practical men in the kingdom, that the duty will be reduced full one-half, this coming year, on many of the staple articles of foreign produce, (*i. e.* food,) which, it is to be sincerely hoped, will be met with corresponding reductions on the part of the United States in its present high tariff.

I remain, your most obedient servant,

GEO. W. ATWOOD.

London, *December* 2, 1843.

DIRECTIONS FOR PREPARING PROVISIONS FOR THE ENGLISH MARKET.

Pork should be packed in barrels containing 200 lbs., in pieces to average 4 lbs. as near as may be; every barrel should have one iron hoop at each end, besides the usual full hooping with wood. Care should be taken that the pieces are neatly cut, and the blood should be so drained off as not to discolor the pickle. No heads should be packed in the prime pork, and not more than four shanks, each to be cut into two pieces.

Mess pork, of course, is to have neither heads nor shanks; and my opinion is, that little or none but mess should be put up for the English market. Very large pork is not suitable; pigs weighing about 200 lbs. are of the best size. Each barrel should be marked with the packer's name, the number of pieces in the barrel, and the date when it is packed. Before shipment, care must be taken that every barrel is full of pickle, and, when packed, an inch or two of rock salt should be placed at each end. If prepared expressly for the English market, with the view to shipping it to me, I would recommend a mark on the other end of the barrel. A good brand, once established, will greatly facilitate future operations.

J. W. & Co.—Packers.

MESS PORK.
50 Pieces.
CINCINNATI,
January, 1844.

Packed for the English Market.
As directed by F. B. O

Beef should be packed in tierces containing 304 lbs., with an iron hoop at each bilge and at each end; it should be neatly cut into pieces weighing, as near as may be, 8 lbs. It would be folly to send any but the first quality, and great care should be taken in curing it. It should be well drained and purged of the blood before it is packed for exportation, and during this process a sufficient quantity of saltpetre should be used, to give it a good color, and prevent its taking too much salt. Turks' Island is the best salt to pack it in; and each tierce, after being filled and coopered, must have as much good strong pickle as it will receive poured into the bung-hole, which must then be carefully secured. Pork and beef is sold in *bond*, and much of the latter is sent to India; the best quality had, therefore, better be marked thus:

J. W. & Co.—Packers.

INDIA MESS BEEF.
38 Pieces.
ST. LOUIS,
January, 1844.
F.B.O.

A little extra pains being taken to prepare the beef and pork of the western country for the English market, I feel quite assured will always give it a preference over the Irish, and make it command a ready sale.

Hams.—Small hams (pigs of about 200 lbs.) neatly trimmed and carefully cured, not to be too salt, nor very highly smoked, carefully done up in canvass bags when quite dry, and packed in air tight hogsheads, will always command a good market. I think the bags had better be made to tie over the hams, rather than to be sewed over them; they will then be more easily examined; and, being packed away in chaff or kiln-dried saw-dust, will probably preserve them, without the necessity of white-washing.

Bacon.—Sides of bacon carefully cured and packed in tierces, to be marked as *mess pork*, will be received at pork duty, 8*s*. per cwt., instead of 14*s*.; and taken out of pickle and dried here, will be a good article. Care must be taken to have them neatly trimmed, and so packed as to come out smooth and flat.

Lard.—The demand for lard is constant, and very little fluctuation need be apprehended. That of the first quality, for culinary purposes, should be in kegs, great care being taken to have it as white and pure as possible. Inferior qualities may be packed in barrels, secured like the pork barrels, with an iron hoop at each end.

FRAS. B. OGDEN.

LIVERPOOL, *December* 11, 1843.

Circular from a respectable American house in Liverpool.

PROVISION TRADE WITH ENGLAND.

As the season is now approaching for the commencement of your fall and winter operations in the way of curing and packing provisions, we are desirous of laying before you the following instructions relative thereto, feeling that they are important to all who contemplate a trade with this country. Judging from the operations in this and the London market for the year now about closing, it is evident that there is a large opening here for your surplus produce, when put up to correspond with similar productions of our own. That American provisions are in much favor here, cannot be denied. In beef, the superiority of the first quality over what is generally packed in this country, is admitted; and it only seems necessary to give proper attention to the curing and packing, to insure a large and profitable market. With these few preliminary remarks, we will now proceed to give such hints on each article as will, in our opinion, be highly conducive to your interests if followed up.

Beef.—Immediately on the adoption of the present tariff, we had a considerable influx of all sorts of this article from your side; a large majority of which was totally unsuitable, both in quality and packing, as doubtless many have experienced from their account of sales. A small proportion proved fine meat, but badly packed or messed; and a still smaller part only seemed to be what was wanting in quality and packing. During the present year our receipts have been much more extensive; and, we are happy to say, that where the instructions of ourselves and others have been attended to, an article precisely suited has been received, and the result, in point of price, has been highly remunerative to the shipper. Our own sales of mess and extra mess fully bear us out in this remark, for we have reason to believe that in several instances they have paid, including exchange, from 10 to 20 per cent. profit; and this, after being put up in the city of New York. What, then, would have been the result if it had been packed in Ohio or Illinois, where the meat would probably have cost only half the price?

Instructions for packing.—Fine fat heifer, or young steer beef, is much liked. Bullock or ox beef from 7 to 10 cwt., where the flesh has been put on the carcass in a short period, thus causing it to be tender; it is in high favor. Tierces have a decided preference over barrels, and should contain

38 pieces, of as near 8 lbs. each as possible, making 304 lbs.; but to insure this weight, 308 to 310 lbs. should be packed up, as there is always a decrease in the first three or four months. The tierces should be full bound, with one iron hoop at either bilge, and also one at either chime, with strong ash or hickory between, as also one at the chimes, partially to cover the iron hoop there. Ash staves are preferred, as not giving a brown color to the meat. Walnut staves should certainly be avoided A tierce of No. 1 prime may be composed of 8 lb. pieces of brisket, flat rib, navel, shoulder, and sticking pieces. Mess should be the same, omitting the shoulder and sticking pieces. Extra mess, or India, should be of 8 lb. pieces of brisket, flat rib, standing rib, a piece or two of the rump with suet taken out, and a fine fat round in the centre of each tierce. An inferior description of these three qualities may be made, and called "cargo"—say to consist of shanks, necks, sticking pieces, shoulders, with a few pieces of brisket, flat rib, and navels, to redeem it. We do not, however, recommend this low quality.

If barrels be used instead of tierces, (which should not be the case,) the assortment in each should be the same, and the weight be fully 200 lbs.; to insure which, 203 or 204 lbs. should be packed up. Barrels will do, with one iron hoop at each chime, with a wood one nearly to cover it, and eight or ten good ash hoops under. The manner of cutting up beef is very important, that every piece may be fair and square, and be at once known when the eye rests on it. The *cleaver* should be entirely excluded in this operation, and nothing but the saw and knife used, that every piece may be quite smooth. We deem this very important, and cannot too strongly urge the point. The meat should be of a bright cherry color, and the fat firm and yellow.

Pork.—It is desirable that this important article should assimilate as much as possible to the Irish, in every respect. As yet, we have had very little of your first-rate hard pinky pork. A very large proportion of what has been received has been soft and oily—often cut with a dull cleaver, instead of a knife and saw, and hence ragged at the edges. Nothing but the solid corn-fed pork should be sent here. There has been too much reason to fear that hogs fed for oil have been packed for pork. We are aware that no country can produce better pork than yours; and, as natives of it, we are very desirous to see pork take its proper rank here, and shall be proud to aid by our exertions in bringing about this desirable object. In this article we deem it necessary to make only two qualities—say prime and mess. The former, consisting of houghs, necks, shoulders, rump-pieces, with some side cuts, all in pieces about 4 lbs.; and the latter (mess) to be rump and side pieces only, cut square, of 4 lbs. weight or thereabouts. As in beef, so in pork—we recommend that it be in tierces of 304 lbs. good weight; but this is not so important as with beef. If in barrels, the weight should be fully 200 lbs. Whether in tierces or barrels, they should be made in the same way as described for beef. Much of the New Orleans pork (as it is here called) has been found to be covered with a thick, slimy, red matter—doubtless arising from the use of rain water without preparation. Could not the pickle be boiled and well skimmed before use? or could not the water be passed through a body of sand, to act as a filterer before put to the salt, and then well skimmed, drawing it off from all sediment? We deem something of this sort important to free the pork from the red deposite on it. To give the pinky color alluded to, as well as to give firmness to the meat, we presume about one ounce and a half of saltpetre per cwt. will be required.

Hams.—This is an important article, if we can but get them to suit, the consumption being very great. Of the large quantity imported since the opening of the trade, but a very small proportion has been what was wanted. Several errors have been committed in this article, the most prominent of which are over-smoking, and packing in casks; by which latter plan they have arrived in a heated state, or rendered very soft. We are of opinion that much less smoking than you are in the habit of giving them would, if they can be made quite dry by it, answer much better for this market; or if they can be dried without smoking at all, they would be preferable to the oversmoked. The mode of curing with sugar and molasses added to the salt and saltpetre is much approved, as increasing the flavor, and rendering them tender when cooked; but still, very excellent hams are made without this addition. We would recommend that each ham be first covered with brown paper, and then with bagging or canvass neatly sewed to fit the ham; then handsomely marked, with a string in each knuckle to hang it up by. The plan of packing them in casks after being bagged, is not only a superfluous expense, but tends to their arriving in a heated state, which is their ruin. The bagging is a sufficient protection of itself, and, if stowed in the between-decks of a vessel, where there is more or less air, they can be landed in good order, and at a more moderate rate of freight than when in casks. Hams must be cut short, and nicely trimmed.

Lard.—This article is of great consumption, it being used by all classes for culinary purposes; while the inferior qualities are taken by the oil-makers and soapers. Very white solid leaf-lard should be in kegs or firkins; while anything inferior to it may be in barrels, or half barrels—the price not being sensibly affected thereby. We would recommend the fine white leaf lard in bladders, and then packed in moderate sized casks, if it were possible to receive them without damage or deep indentures; but we fear it cannot be done, and therefore we recommend kegs or firkins for it.

Tallow.—This article has long been known of extensive consumption by tallow chandlers, and latterly for machine purposes. Solidity and good color are its principal requisites, and tierces the best packages for it.

Grease.—This is another article of great consumption by the candle-makers and soap-makers, let the quality be what it may, and may be sent in any sort of package; but the actual tare of each should be marked on each, which saves trouble and expense here in ascertaining it.

Lard-oil.—This is a new article everywhere, but more so here than with you. Its applicability for all the purposes to which sperm and olive oils are applied, renders it valuable; but an early check has been given to its use, by an order from the board of trade to raise the duty to 20 per cent. on its value, instead of 1*s.* 3*d.* per cwt., as laid down in the tariff—making a difference of about 6*s.* per cwt. Should it be found quite suitable for machine and engine purposes, as also for clothiers' use, the high duty will not, we think, prevent its introduction, as it still will rule at a lower price than olive oil. The pure white limpid lard-oil, free from odor, ranks highest with us, and should be in good oak iron-bound casks or barrels, with painted or whitewashed ends.

Cheese.—Of all articles of American production, this has met, thus far, with the most favorable reception. Large quantities of all qualities have been received since the new tariff came into operation, which, generally speaking, have been taken off with rapidity. Really good, mild, fine, *large* cheese, is constantly in demand and ready of sale. The commoner quali-

ties move off nearly as rapidly for consumption amongst the lower classes; and now that we are about to experience an extensive revival in the trade of our manufacturing districts, we are of opinion that we shall see a greater demand than ever during the coming year. Large cheeses (of say 60 lbs. and upwards) are in much favor, and should be in boxes; while the smaller will do in casks. They should be perfectly sound, well pressed, and free from the rennetty flavor, as well as from what we call pasture flavor, and without color. If shipped new, the edges should be bound round with thin canvass, to prevent cracking. Cheese a year old is much more desirable than the new.

Butter.—Our duty is so high on this article, (20*s.* per cwt., and 5 per cent. added,) that we can only encourage the shipment of it for sale in bond; that is, for exportation without paying the duty. It should be packed in firkins of 45 to 60 lbs., laid in layers, with a small quantity of salt between, and the firkins filled with pickle. The color should be the natural one.

Tongues.—Neats' and pigs' tongues are of considerable sale, if nicely cured, so as not to be hard. Saltpetre should be used to give them a fine red color. They should be trimmed of all the root, excepting the fat on the under side. The neats' tongues may be in barrels of 200 lbs., and half-barrels of 100 lbs. The pigs' tongues should be in very nice full-bound half-barrels of 100 lbs., and both handsomely marked on the heads with the packer's name.

LIVERPOOL, (ENGLAND,) *August*, 1843.

DIRECTIONS FOR PREPARING BEEF, PORK, AND LARD, FOR THE ENGLISH MARKET.

Beef.—Kill fat cattle only. All parts are used but the head, feet, and legs; to be cut as nearly as possible into pieces of 8 lbs. each. Pack away in store casks, with dry salt well rubbed in; the casks to be filled up with pickle —sufficient saltpetre being added to give a bright color and proper consistency. In a day or two, or as soon as the blood is sufficiently purged out, the beef is to be removed to fresh pickle, where it remains until packed for exportation. All pickle to be made strong enough to float an egg, and the scum to be taken off after settling. *Observe*—saltpetre must not be used in any pickle after the first. To be packed in barrels containing 25 pieces, or 200 lbs.; or tierces containing 38 pieces, or 304 lbs.; perfectly water-tight, with two iron hoops at each end, and made just to fit.

It is important that, when the packages are opened, the beef should present a sightly appearance to dealers. The edges of the pieces to be trimmed and laid in smoothly. Between each layer some fine salt is to be used; and, over the top of the whole, an inch or two of very coarse Turks' Island, or St. Ubes, should be placed. *Pack dry*, and, after heading, pour through the bung hole 3 or 4 gallons of fresh pickle.

Pork.—In curing, the same process is to be observed as for beef. It must be cut into 4 lb. pieces, and all parts used except the head, feet, and legs to the knee-joints. To be packed for exportation in barrels of 50 pieces, or 200 lbs.

Avoid, in all cases, Government inspection as a legalized robbery. Each packer must brand his own name conspicuously on the head of his casks with the number of pieces and description of beef or pork. A favorite

brand will often sell from 5*s*. to 10*s*. per tierce more than one unknown to the English purchaser.

Lard.—Really fine lard for culinary purposes should be packed in neat white kegs of about 40 lbs. each. It should be poured in and allowed to cool *before* heading; a piece of white paper to be laid on, to prevent its adhering to the top when opened; the kegs, in all cases, to be full.

So much care is not required in barrel lard, which is chiefly used for chandlery purposes, or machinery; but, if poured in before heading, there would be a greater certainty of the packages being full.

LIVERPOOL, *October* 18, 1843.

WILLIAM GARDNER.

No. 29.

[From the Liverpool Courier.]

THE NEW TARIFF.

Yesterday, the first sale of foreign provisions, under the new scale of duties, took place in this town. The quantity offered was considerable, and the attendance appears to have been extremely good; many persons having come from distant parts of the country.

Yesterday (the 10th of October) was the day fixed by the new tariff, for the reduced duties on salted provisions, and, in consequence, public sales to a considerable extent were arranged to take place this day. These sales comprised 1,522 barrels of American beef, 2,199 barrels of American pork, 311 barrels of American hams, 691 barrels of Canadian pork, and 35 barrels of Canadian beef; and excited considerable interest and curiosity. The attendance of town and country dealers at the sales was numerous, and there were some gentlemen from Ireland—the latter, no doubt, chiefly to watch the progress of a trade threatening to interfere with that which they have enjoyed, exclusively, so long.

It must be observed that the greater portion of the United States meats were imported some months ago, and, having been cured before it was known that there would be a change in the British duties, were not so well suited to the taste of consumers here, as, doubtless, they will be rendered hereafter. The pork was generally very well fed, but rather fatter than the usual run of Irish. Of the beef, on the contrary, it was observed that it was not sufficiently well fed. We question whether the sales have resulted to the satisfaction of the importers generally. The buyers evidently acted with more wariness, from being new to the trade.

Of the United States provisions, a large portion was withdrawn. The hams sold fetched 30*s*. 6*d*. to 31*s*. per cwt., duty paid. A very old parcel went even lower. Pork, 41*s*. to 46*s*. per barrel, duty paid. The Canadian pork realized 43*s*. to 46*s*. per barrel, duty paid. Of the Canadian beef there was little offered, which realized, for prime, 46*s*. to 48*s*., and one lot of prime mess 50*s*. per barrel, duty paid. Several parcels of American cheese were offered and sold at 36*s*. 6*d*. to 46*s*. 6*d*. per cwt., duty paid, for inferior to middling quality; whilst a few lots of "good" brought 50*s*. to 54*s*. per cwt., duty paid.

The new tariff—importation of foreign provisions.—A small quantity of foreign pickled beef and pork has, this week, been received here (Berwick) by Mr. James Sanderson, for the purpose of ascertaining its quality, and the probability of its commanding a sale in this town, whose district is so justly celebrated for producing the excellent of both. The sample has been highly approved of; the pork, in particular, being of superior quality. The beef is from Holstein, in Denmark, and the pork from America. A supply has been ordered, which will probably be remitted here by the return of the steam packet Manchester from London. The sample has been sold at—beef, 4½*d.* per pound; pork, 4*d.*—*Berwick paper.*

Among the novel imports under the new tariff, an importation of 137 live geese from Norway has been made at this port during the present week. They were in tolerably good condition, and were readily disposed of at 3*s.* 6*d.* each.—*Newcastle Journal.*

Price of butcher's meat.—Beef from Hamburg was exposed for sale in our market on Saturday. It was very fine, and attracted general attention. Choice cuts of foreign, as well as of domestic beef, were 8*d.* per pound; or, with boiling pieces, 7*d.* So that, as far as fresh meat is concerned, prices have not, through the operation of the tariff, declined materially in the Liverpool market.—*Liverpool Albion.*

American pork in Hertford.—We are informed that American pork, of the first quality, is selling in this town at 4*d.* a pound—half the price of English, or something less.

The new tariff.—Falmouth, *October* 15.—Very prime corned pork, and beef, imported from Hamburg, has been in demand at 3½*d.* to 4½*d.* per pound. The Sarah landed to day, direct from Corunna, 38 head of oxen. They are fine cattle, and will be sold by auction.

The beneficial effects of the new tariff have, we congratulate the public, reached Bedford, by affording to us excellent American salt beef at 4*d.* per pound.—*Bedford Mercury.*

The tariff beef and pork.—Since our last publication, considerable excitement has been produced in the city by importations of salted beef and pork, which have been retailed in various places at 4*d.* per pound. Messrs. Westlake & Co., Fore street hill, were the first to announce that they had a supply of American pork and Hamburg beef at 4*d.* per pound; and on Saturday, particularly in the evening, after the artisans had received their wages, the shop was crowded with customers, to whom several hundreds of pounds weight of the imported meat were sold. During the week, the same kind of provisions has been on sale at Lucke's, Fore street; butchers', High street, and butchers', Blackroy road; all of whom have made considerable sales. We have seen some of the beef and pork. Both were very good, and some of the latter was exceedingly fine. The beef is now selling at 3½*d.* per pound.—*Western Times.*

To cook the tariff beef and pork.—A correspondent (for whose letter we have not room) states that the best way to cook the recently imported beef and pork, is to soak it in cold water for from 12 to 24 hours, changing the water three or four times; and then to simmer it gently till done—taking care that the water does not boil. By these means it will eat very tender and juicy.—*Western Times.*

Foreign meat, &c.—American pigs are fed by ranging in the woods and eating acorns, and afterwards with the best of all descriptions of food for fattening—Indian corn, frequently ground into meal. It is this description

of food that causes the pork to be so fat as it is, and it is this which induces the fine flavor which is discoverable in no other pork. A few days since, I heard the captain of a vessel say that American pork was too fat, and that it had a peculiar flavor. I, in consequence, obtained a piece of Canada pork, out of a barrel belonging to a parcel which arrived in this port six weeks since. I had it boiled, and invited the captain and some others to examine the result. Without one exception, it was pronounced to be the sweetest, the best flavored pork they had ever tasted. Now, as this description of pork has, of late, been selling in Liverpool, it could go into consumption at $3\frac{1}{2}$*d.* per pound, and afford a fair rate of profit to the retailer; and for ships' stores, it could be put on board for 27*s.* to 30*s.* per barrel, or about $2\frac{1}{2}$*d.* per pound. So much for Sir R. Peel's new tariff, which, happily for the kingdom, will be the means of reducing the enormous price which butcher's meat had attained. We have, latterly, had incontestable evidence, through large importations, of the fine quality of American cheese and hams. In my house, I have consumed a couple of the latter, for which I paid a retailer 6*d.* per pound. They are equal to Westphalia, for which I not long since paid 9*d.* These hams were cured in the western States of America, and were sent down the Ohio to New Orleans, where they were shipped to Liverpool. Pickled hams have also been imported, of the finest description, which have been selling at about 35*s.* per cwt., duty paid, or 3*d.* per pound; and after the 10th of October, they, doubtless, will be sold to the small consumer at a low price. The Americans kill all their pigs and cattle during cold weather and the winter season, so that tainted meat is less likely from that, than any other quarter. Hog's lard from the States is likely to be imported in large quantities, the duty being reduced 75 per cent. In this country, it is made use of for a variety of purposes, particularly as a substitute for butter by confectioners; but I have never known it used here as a substitute for butter in the frying of fish. During a period of more than twenty years' residence in the United States, I never knew fish to be fried with anything but hog's lard. This article will be sold ere long, in the English market, for less than half the price of butter.—*Correspondent of the Liverpool Albion.*

No. 30.

Letter of W. Milford, Esq.

Custom-house,
Cleveland, January 2, 1844.

Sir: I have the honor to acknowledge the receipt of your letter of the 13th ultimo; and, in reply, have to say that I have taken considerable pains to obtain the information you desire, and the following is the result:

I find that trying up pork by steam, for lard, has not been practised this season in this section of country. Pork commands a higher price than it did last year, and pays better to pack.

All the beef that has been packed here for the English market has been packed in tierces: each tierce contains 304 pounds of beef—38 pieces of 8 pounds in the tierce. Pickle and meat weigh 500 pounds.

The cost of a tierce of beef here may be estimated at $8.

The expense of freight, &c., is as follows:

Cleveland to New York, per tierce - - - -	$2 12½
Expenses in New York (if not re-packed) - - -	25
(If re packed, an additional charge of 75 cents.)	
Shippers expect to get clear of charge for re packing, as the law of the State of New York, requiring re-packing, is repealed.	
Freight from New York to Liverpool - - - -	1 10
	3 47½

In packing, two qualities are made—namely, India mess, and navy mess. India mess is worth about $3 per tierce more than navy; the proportion depends entirely upon the quality of the cattle; the proportion here has been small—not exceeding one-tenth. The beef is soaked before packing; and for a tierce the following is used: 80 pounds coarse salt, 20 pounds fine salt, and 8 ounces saltpetre.

There has not been any pork packed here for the English market.

There have been over six thousand head of cattle slaughtered here, and about 7,500 tierces of beef packed for the English market.

Mr. J. R. Stafford, of this city, has promised me to furnish you with a statement and his views in reference to lard oil.

I hope to be in Washington about the 15th of this month, when I shall have the pleasure of seeing you, and any further information which I can give shall be furnished cheerfully.

Very respectfully, your obedient servant,

WILLIAM MILFORD, *Collector.*

Hon. H. L. Ellsworth,
Commissioner of Patents,
Washington City, D. C.

No. 31.

MODE OF PREPARING HAMS.

For the following receipt I am indebted to the Hon. E. Whittlesey:

A common barrel will hold about 150 pounds of hams, and the receipt is for a barrel supposed to contain that weight.

We kill our own hogs, and the meat is cut up before it becomes cold; and then the hams are put on a table or shelf, on the skin, where they lie until morning to cool, but not to freeze.

Permit me to suggest to you that if the skin becomes dry and hard, it is impossible to restore it to its soft flexible state; you have probably noticed this in the feet you have bought in the market. The hams should be taken in hand the day the hogs are killed. To one barrel, or to 150 pounds of hams thus cooled, the following compound is to be applied:

Four quarts of salt, two pounds of sugar, and one pound of saltpetre, pounded fine and rolled together until they are fine and fully mixed. Each ham is to be thoroughly rubbed with this compound over the entire surface, and as far around the bone as it can be reached. The rubbing should be hard and well applied. The hams are then packed in a barrel

as tight as they can be placed, where they lie two weeks. At the expiration of two weeks, put six quarts of light wood ashes into a kettle, with three pails of water, (about ten gallons,) and boil them about two hours, and let them stand until morning to settle. At the same time make a brine of salt, strong enough to bear up an egg so as to expose the size of a quarter-dollar. The proportion is nine gallons of this brine to one gallon of the lye. The hams must be thoroughly covered; if they rise any, place a weight on them. They remain in this preparation four weeks. Take them out, hang them up one day to drain, and then put them in the smoke house, and smoke them with hickory wood if possible. Hams are very frequently spoiled in smoking, by an unsavory smoke and by heating. A smoke-house, should not be light, to make the best hams; and they should never be so heated as to run or drop the fat.

We keep our hams in a dry, dark room in the second story, where a fly never enters. Some people put them down in ashes, salt, bran, or grain, and others encase them in cotton bags and whitewash them. We prefer the dark room, as they are safe and are clean.

Fair View, Prince George's, Md.,
November 12, 1840.

Dear Sir: I received a letter a few days ago, which I suppose was intended for me, directed "D. Bowie," as I have sold hams to the Messrs. Parker of Washington, which they informed me had been much admired. If I am correct in supposing I am the person for whom the letter was intended, in which you ask my manner of curing hams, I will with pleasure furnish it for your own use, or for the use of others. In the first place, my hogs are abundantly fed with corn for six or eight weeks before they are killed, then killed and cut out in the usual way. I weigh 1,000 pounds of hams, take three pecks of salt, three pounds of saltpetre, two quarts of hickory ashes, two quarts of molasses, and two tea-cups of red pepper; mix all well together on a salting table; rub the rind or skin of the ham well, and sprinkle with the balance; let it lie from five to six weeks, then hang up and smoke with green hickory wood for five or six weeks; a little saw-dust also, if convenient. The red pepper prevents the skipper, I think. If the hogs are very large, I think more salt would be required. I generally put the large hams at the bottom of the tub.

I have intended to call and look at your piggery, hearing you have some very fine hogs of superior breeds.

With much respect, your obedient servant,

WM. D. BOWIE.

No. 32.

ON PLANK ROADS IN CANADA.

Lord Sydenham, during his long sojourn in Russia, travelled on several of them, and found them well adapted to the circumstances and the climate; and, as both were very similar to those in Canada, he was

strongly of the opinion that their introduction there would greatly conduce to the public interest. A few miles of road in the neighborhood of Toronto was first laid with plank by the local commissions who had the management of it. The cost of stone, and the great expense they had been at in macadamizing a portion of the same road, as well as the heavy annual repairs, had induced them to try the experiment in that province of laying a planked surface on the road. A gentleman, describing it, says: "The few miles nearest the city, and over which very considerable traffic existed, were planked; and, upon inspection, it was found the top surface of the timber was worn in the centre for the breadth of 7 feet, and to the depth of $\frac{5}{8}$ of an inch; the ends being to the full dimensions as the plank came from the saw. The bottom, or underside of the planks, was found throughout perfectly sound. In two or three places, where a small cavity was left by the foot of a horse or other animal, there was found a slight pinkish tinge corresponding with the cavity, and indicating the commencement of fungus. The sleepers appeared perfectly sound." The facts elicited by examination of the portion of the road laid down but one season, were the same as the foregoing, except that but $\frac{3}{8}$ of abrasion had taken place. From the foregoing, it will be seen—

1st. That the wear and tear of the plank road, even near a populous town, is confined to the seven feet in width of the centre.

2d. That, for the preservation of the planks from decay underneath, it is indispensable that every portion of it be solidly imbedded in the formation.

3d. That considerably more than half the wear and tear which occurs in seven years' use of the road, takes place the first year; which is easily accounted for, by the natural stripping off, while the plank is fresh, of those fibres which were cross-cut by the saw; and from the fact of the dung of the cattle getting bound with the raised fibre of the wood, and thus forming a tough elastic covering, which saves the plank, in a great measure, from the effects of the horse's shoes, and the tire of the wheels. On this road the plank is 16 feet long, 3 inches thick, laid crossways at cross angles to the road, on 5 sleepers of pine 5×3 laid on edge, and in the line of the road; and this was considered the best mode of laying a plank road, except that on a country road plank 8 or 10 feet long will be found quite sufficient. On the Chambly road (plank) the planks are 12 feet long, but laid diagonally, so as to make the road but 8 feet wide. This was opposed by some, and very justly; for, as apprehended, the weight of half the vehicle and load coming suddenly on one end of the plank, and the other end not being kept down at the same time, the traffic constantly tends to disrupt the road, and the planks are loose, and spring from end to end. Another principle connected with the laying of this road, (which was opposed,) is that of having the sleepers of much larger scantling than on the Toronto road. It was remarked that, as all earth formation under a road of this nature will more or less subside and shrink, the giving to the sleepers too much area would enable them to bear up the plank, leaving the earth to settle from them, thereby causing springing in the plank, which tends greatly to their being cut away; (in fact, they quickly become rounded from the edges;) and, also, that fungus and decay of the plank would be brought on, in consequence of the confined air below. These apprehensions are realized. At Quebec, part of the road has been planked, the plank being laid lengthwise of the road. It was considered that the planks would stand better the

friction, and, when necessary, could be more easily taken up, and the road repaired. One strong objection to this mode of laying the plank is found to be, that the horses cannot keep their feet when much weighted, and are much exposed to falling, in consequence. Under all the circumstances, most have approved the manner in which the planks are laid on the Toronto road. Those now being planked under the department in the western section of the province are so laid, except that the planks are spiked with a $5\frac{1}{2}$-inch spike—one in each end. With respect to plank roads generally, I wish none to suppose that I am an advocate for their adoption, except in those sections of the country where nature has afforded no better material, and where funds can be obtained for a better structure. There are stretches of 30 and 40 miles, in parts of the west, where the soil is a deep rich vegetable mould, and without stone or gravel of any description; in such cases, you must be content to wade through the mud, or adopt plank roads. When the traffic or intercourse of a section of country requires that good roads should be afforded for it, the adoption of plank or stone roads should be governed simply by a comparison of the first cost of each, in conjunction with the probable annual expense of repairs; and if this comparison is based on the plank lasting but 12 years, (or some say 10 years,) a safe conclusion will be arrived at. In some cases in Canada, the adoption of plank instead of stone would have made such a saving as would have replanked the road every five years, if necessary. There are many sections in the west, where timber abounds, especially in Ohio, Indiana, and Kentucky, where such roads might be introduced with great advantage.

No. 33.

Letter of R. L. Robertson, esq., relating to Ericsson's propellers on Lake Erie.

BUFFALO, *January* 8, 1844.

SIR: The inquiries propounded by Mr. Ellsworth relative to the Ericsson propellers, as to draught, convenience, strain, speed, &c., can only, at the present time, be answered as follows: If by draught is meant the water drawn by such vessels, I can only say that the propellers, carrying the whole engine and boiler at the stern, draw more water aft than any other class of vessels when light. If by draught and convenience is meant the quantity and weight that can be conveniently stowed and carried, I answer that the propellers, from having the engine aft, can stow cargo with greater convenience than steamboats; and as the engine is much lighter and more compact, they can carry more weight, and are infinitely better calculated for our carrying trade. The strain of the Ericsson propellers on the whole stern frame of the vessel is great, and more particularly severe when the vessel is light; the strain upon all parts of the engine, in a sea-way, is also very severe—more so than that of a steamboat.

Our experiments on the lakes do not enable me to answer fairly the question as to speed. Our harbors are shallow, and we are obliged, in consequence, to build our vessels for a light draught of water, necessarily confining the size of the propelling wheels to certain limits; what effect an increase in size would have, is left to conjecture. I do not think that any

of the eight Ericsson propellers running last season have exceeded eight miles per hour by steam alone.

In every instance on the lakes, the boilers have been failures. The flues have never stood fire, nor have the boilers been constructed with a due regard to the consumption of all the heat from the fuel; with proper boilers, the speed doubtless might be increased, and an economy in fuel effected. The amount of fuel consumed must be in proportion to the size and excellence of the boiler, and must ever be as various in propellers as in other steamboats. As sea boats, the propellers are superior to the ordinary steamboats, being enabled, imperfectly as they are at present constructed, to ride out heavier weather; and, as has been proved in many instances, by using canvass and steam, they have turned to windward in a gale of wind, when our best steamboats have been compelled to bear up, and run for a harbor.

An Ericsson propeller, to carry the same amount of weight with a steamboat, can be built at a much less cost on the lakes, and probably elsewhere—at least sixty per cent. less than the cost of an ordinary steamboat. In running expenses, the propeller has the advantage at about the same ratio.

I do not think, in the present state of these boats, more can be said with safety. From their friends you will get exaggerated accounts of their convenience, economy, and speed; while, by their foes, they will be pronounced worthless. Neither accounts are to be relied on. From my own experience of two years in command of an Ericsson propeller on the lakes, I am fully satisfied that they are susceptible of great improvement; and although I would not encourage over-sanguine expectations, yet I would be unwilling to see them condemned without further trial.

Yours, respectfully,

R. L. ROBERTSON.

The Collector *of the port of Buffalo, N. Y.*

No. 34.

ON THE CULTURE OF THE APPLE.

Sir: At your request, I send you herewith my mode of cultivating the apple tree.

For some years I have been experimenting upon the apple tree, having an orchard of 20,000 bearing Newtown pippin trees. I have found it very unprofitable to wait for what is termed the bearing year, and, consequently, it has been my study to assist nature, so as to enable the tree to bear every year.

I have noticed that it produces more profusely than any other tree, and, consequently, requires the intermediate year to recover itself, by extracting from the atmosphere and earth the requisites to enable it to produce.

One year is too short a time for so elaborate a process, and, if unassisted by art, the intervening year must necessarily be lost. If, however, it is supplied with the necessary substances, it will bear every year—at least, such has been the result of the following experiments.

Three years ago in April, I scraped all the rough bark off several thousand trees in my orchard, and washed the trunk and limbs within reach

with soft soap, trimmed out all the branches that crossed each other early in June, and painted the wounded part with white-lead, to keep out moisture; then split open the bark, by running a sharp-pointed knife from the ground to the first set of limbs in the latter part of the same month, which prevents the tree from becoming bark-bound, and gives the inner wood an opportunity of expanding.

In July, I placed one peck of oyster-shell lime around each tree, and left it piled about the trunk until November, during which three months the drought was excessive. In November, the lime was dug in thoroughly. The following year, (1842,) I collected from those trees 1,700 barrels of fruit, some of which was sold in New York for $4 per barrel, and others, in London, for $9; the cider made from the refuse, delivered at the mill two days after its manufacture, I sold for $3 75 per barrel of 32 gallons, not including the barrel. *In making cider, I never wet the straw.* After gathering the fruit in October, I manured the same trees with stable-manure, having secured to it the ammonia, and covered it immediately with earth.

Strange as it may appear, this year (1843) the same trees literally bent to the ground with the finest fruit I ever saw. The other trees in my orchard, not treated as above, were barren.

I am now placing around each tree one peck of charcoal-dust, and propose, in the spring, to cover it from the compost heap.

I have grown corn, beets, and carrots in pure charcoal-dust, likewise cuttings of the rose-bush, camella japonica, grape-vine, and wax-plant, and believe it to be one of the most valuable manures we have. Once placed upon the soil, it is there forever.

PLUMS.

Fourteen years since, I removed 80 plum trees from the lower part of my farm in the month of May, and set them in rich, sandy loam land, which is the best soil for them. They were valuable varieties, such as the blue gage, yellow egg, magnum bonum, &c., and had borne profusely 4 years before they were taken up. For the space of 13 years after their removal, they never bore a single plum, although they grew luxuriantly. In the fall of 1842 I placed half a bushel of shell-lime round each tree, and last March, half a bushel of pulverized charcoal. In May they were covered with blossoms, and bore a profusion of fruit.

When large black excrescences appear on plum trees, I cut off the limbs affected, and burn them. They are caused by a worm.

Yours, very respectfully,

ROBT. L. PELL.

Hon. H. L. Ellsworth.

No. 35.

Letter of Mr. Clark on California tobacco.

Willow Grove, Orange county, Va.,
February 13, 1844.

Dear Sir: Agreeably to my promise, I enclose you the California tobacco seed. It grew from the small parcel given to me by Mr. William

Smith in your office, in March last. On getting home, although late, I prepared a bed, and sowed the small parcel the first week in April; and not having seed enough to finish the bed, sowed the balance of the bed in Oronoco tobacco-seed; and, to my astonishment, the California plants were soon ready to set out—as soon as the other kinds of tobacco sown in the month of January; and the Oronoco seed, that was sown with the California, did not arrive to sufficient size until it was too late to set out. The California tobacco, if it continues to ripen and grow for the time to come, as it did for me on the first trial, must come into general use—first, because the plants are much earlier in the spring (say ten days, at least) than any kind we have; secondly, when transplanted, the growth is remarkably quick, matures and ripens at least from ten to fifteen days earlier than any kind of tobacco we have in use amongst us. It is a large, broad, silky leaf, of fine texture, and cures of a beautiful color, and some plants grow as large as 7 feet across from point to point; and, upon the whole, I consider it a valuable acquisition to the planting community. The seed I send you have come much more to perfection than the seed I obtained from you; which circumstance, I think, is favorable to its being adapted to our climate.

I would be glad if you would send me two or three of your documentary reports, as Commissioner of Patents, for myself and neighbors, that we may see the progress your valuable institution is making in promoting the interests of the agricultural community of our beloved country.

Respectfully, yours, &c.,

W. D. CLARK.

Hon. H. L. Ellsworth,
Commissioner of Patents.

Note.—This seed is all distributed.

H. L. E.

No. 36.

ON THE CULTURE OF PUMPKINS ON GRASS LAND.

The following letters, addressed to the Hon. Francis Price, of New York, and his letter communicating the same to the New York Farmers' Club, a branch of the American Institute, respecting the culture of pumpkins on grass meadows, have been kindly furnished by a gentleman connected with that institution.

Weehawken, N. J., *December* 22, 1843.

Agreeably to promise, I enclose to you the account of an experiment made by the gardener at your public place, known as the Weehawken pavilion. After preparing a place for the deposite of two Lima squash seeds within three feet of the vegetable garden, and directly in the grass, or meadow, where some weeds had been thrown the previous years, forming a small heap, he hoed them after they had sprouted, I think, two or three times; this was before the vines had commenced to run. In the mean time, the grass in the meadow was sufficiently grown for mowing,

and was mowed accordingly and removed; at which time the gardener commenced training the vines, there being two. One was led to the south, and the other to the north: the one to the south extended about seventeen yards, or fifty-one feet; while the one leading to the north reached about twelve yards, or thirty-six feet—both running directly upon the meadow, so as not to interfere with the ground used for vegetables. By the time the meadow was wanted for the fall pasture, the squashes were ripe, taken from the vines, and weighed. From the two seeds planted, between six and seven hundred pounds of squashes were produced. The vine running to the south had on it about two-thirds of the whole quantity. I mention this circumstance for the reason that vines of all descriptions, from my own observation, are more productive when grown to the east or south, than otherwise. This, perhaps, you have observed; and if you can give, from this short account, information to any one else, you will no doubt be the means of conferring something more useful than I had dreamed of when the experiment was commenced.

I am, dear sir, very respectfully, yours, &c.,

B. JESSUP.

To the Hon. Francis Price.

The other is as follows:

Hudson County, N. Y., *December* 28, 1843.

I take great pleasure in answering your inquiries in regard to the great (and I believe I may venture to say unparalleled) yield from one pumpkin seed. A few years ago, an agricultural friend discovered a pumpkin vine growing upon a heap of manure which had been deposited in a field, and to which he gave the necessary attention through the season, and from which were gathered, in the fall or autumn, between eighty and ninety large and sound cheese pumpkins. The manure had been taken from the cow stables the previous fall, and deposited in an old worn-out field.

Respectfully, yours,

JOHN STURGISS.

Mr. Francis Price.

New York, *January* 18, 1844.

These communications are from gentlemen of known character for truth and respectability. It would appear, from the experiment related above, that any field, no matter how unproductive or impoverished, may be made to yield immediately, and without waiting for years to restore it to general productiveness, vine crops, and, by analogy, all other hill crops, where the roots do not spread to any great extent, with great promise of ample remuneration. It may, indeed, be questioned whether any other method can be adopted, by which a profitable crop can be obtained from exhausted ground, in the same space of time, and with so little outlay or expenditure. But the subject is not confined to exhausted fields, as shown in the case of Mr. Jessup. Here was a meadow, or grass field, the crop of which was cut and gathered without interfering with the vines; and, again, the fruit of the vines was gathered without interfering with the use of the field for pasture in due season.

An acre contains 43,560 square feet of ground; say that, in the case of squashes or pumpkins, a vine requires 50 feet in length, by 5 feet in

width, to afford sufficient sun and air, and that each hill has two vines—the two vines thus occupying, in connexion with the hill itself, (which should contain about nine square feet,) 500 square feet, and, in round numbers, would allow about 90 hills to the acre. The vines will not commence to run before the grass matures, and is cut and gathered. The quantity of ground which 90 hills of 9 square feet each occupy, is about 810 feet. This is all that the grass has been interfered with, or the quantity of grass surface diminished. The vines should be trained to the south, to favor the idea of greater productiveness. Suppose, now, that we allow 400 pounds instead of 700 for each hill, according to Mr. Jessup's experiment; then we should have for the 90 hills 36,000 pounds, or 18 tons of squashes or pumpkins. The value of such a crop in the market of the city of New York, or to the cultivator as food for his stock,* cannot be fixed with any degree of certainty, but which, it must be evident to any person, would be an item, in the general table of profits, of no trivial account, either in connexion with a crop of grass and pasture, or from fields that otherwise would produce nothing.

As already said, this mode of culture may be extended to many other vines and hill products besides squashes and pumpkins; and perhaps there is no other method of securing so good a crop the first season, and on any impoverished soil, which promises equal advantages, and, as in the case of Mr. Jessup, a double crop. The cheese pumpkin does not vine so far as the squash, and therefore would allow more hills to the acre; and, according to the above experiment, it is more productive. I submit the communications of Mr. Jessup and Mr. Sturgiss, with the few brief remarks I have added, to the gentlemen of the club, for the purpose that the subject may receive such consideration as in their opinion it may merit; and especially whether grass fields are not better adapted for the purpose of raising vines, by this mode of culture, than ploughed fields.

Very respectfully,

FRANCIS PRICE.

No. 37.

[From the N. O. Bee.]

Sugar-planters have, no doubt, felt much curiosity to know something of Mr. Riellieux's experiment in the manufacture of sugar, of which we have heretofore spoken. The following letter from Mr. Packwood proves that Mr. R. has succeeded beyond all expectation:

Myrtle Grove, 1844.

To the editor of the New Orleans Bee.

Dear Sir: Your favor of the 12th instant has been received, and with pleasure I reply to your inquiries respecting Mr. Riellieux's apparatus.

Mr. R. contracted to furnish me with an apparatus for the fabrication of sugar entirely by steam; that the quantity of molasses should be reduced to the half of that produced by the old process; that the sugar made from it should be equal to that produced from a vacuum pan, without any refining process; that it should be capable of producing an

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* Suppose $10 per ton equal $180 per acre—cannot be estimated less than good hay.

average of 12,000 lbs. of sugar within 24 hours; and that the fuel con sumed should be not more than one third of the quantity used by th usual method, in open kettles.

I have finished my crop, and made the last 30 hogsheads with his ap paratus, from a piece of my poorer cane. The production of molasses, I believe, is greatly reduced. The quality of the sugar is improved abou one-half in value over that produced from the same cane in my set o kettles. I am satisfied that, with the apparatus, I shall make the nex crop into white sugar, without the use of moulds and liquoring. Th apparatus made at the rate of 18,000 lbs. per 24 hours, and boiled as much cane-juice as my mill could furnish; and it is my opinion that it can produce a much greater quantity in the same period.

The apparatus is very easily managed, and my negroes became ac quainted with it in a short time. To produce the above quantity o sugar by the old process, I should have employed my two sets of kettles boiling together. My sugar-mill and the apparatus were driven together by my engine, and I am convinced that the bagasse of the previous year which generally forms about a third of my fuel, would have been suffi cient to have made my entire crop. The machine is elegant in its pro portions, solid in its fixtures, and occupies a very small place in my sugar house. I must confess that, when I first contracted with Mr. R., I did not imagine that the apparatus would have been so complete. Every part is arranged with the greatest care, and is very durable. It worked, I may say, without any accident; and is ready for the next crop, as new and clean as it was the first day. I account as nothing a leather band, which was temporarily employed by Mr. R. to drive the apparatus, instead of a connecting-rod, which was then not ready.

I am happy to add, that I consider Mr. Riellieux as completely successful, and as having satisfied every condition of the contract which he passed with me.

I had many opportunities of admiring the ability and ingenuity of Mr. R., and I do not hesitate to declare that he is highly deserving of credit, and, in every respect, to the full confidence of the sugar-planters of Louisiana.

Very respectfully, yours,
T. J. PACKWOOD.

No. 38.

The following important communication from Dr. Jackson, of Boston, to the editors of the Boston Cultivator, will be of much interest to the sections of the country where maple sugar is made. The subject of cornstalk sugar has also been particularly commended to Dr. Jackson's notice during the present year, and there is good reason to hope that successful experiments will be made to obviate the difficulties of granulating it.

MAPLE SUGAR.

Messrs. Editors: I beg leave to communicate, for insertion in your paper, the result of some researches which I have made on the manufacture of maple sugar; having been much interested in promoting this branch of New England industry, and being satisfied that, if pursued with skill, it cannot fail to prove profitable to the people inhabiting inland towns where the sugar maple abounds.

It is well known to you, without doubt, that the northern parts of Maine, New Hampshire, Vermont, and New York have dense forests of the sugar maple, and that at present only very rude processes are made use of in preparing the sugar for market, so that it is too generally acid and deliquescent, besides being charged with salts of the oxide of iron, insomuch that it ordinarily strikes a black color with tea. To remedy these difficulties was the object of my researches; while at the same time I was engaged in ascertaining the true composition of the sap, with a view to the theory of vegetable nutrition.

I received several gallons of freshly drawn maple sap from Northampton, Warner, and Canterbury, and made analyses of each lot, separating the acids, salts, and the sugar. I also analyzed the sap of the yellow and white birch, which do not give any crystalizable sugar, but an astringent molasses.

I shall now communicate to you the process by which I manufactured sugar-maple sap received from the Shakers of Canterbury, who collected it with care in a clear glass demijohn, and sent it forthwith, so that it came to me without any change of composition, the weather being cold at the time. The evaporation was carried on in glass vessels until the sap was reduced to about one-eighth its original bulk, and then it was treated with a sufficient quantity of clear lime-water to render it neutral, and the evaporation was completed in a shallow porcelain basin. The result was, that a beautiful yellow granular sugar was obtained, from which not a single drop of molasses drained, and it did not deliquesce by exposure to the air. Another lot of the sap, reduced to sugar, without lime-water, granulated, but not so well, and was sour to the taste, and deliquesced by exposure, and gave a considerable quantity of molasses.

Having studied the nature of the peculiar acid of the maple, I found that its combinations with lime were excessively soluble in alcohol, so that the yellow sugar first described could be rendered white in a few minutes, by placing it in an inverted cone open at the bottom, and pouring a fresh quantity of alcohol upon it, and allowing it to filtrate through the sugar. The whitened sugar was then taken and redissolved in boiling water and crystalized, by which all the alcoholic flavor was entirely removed, and a perfectly fine crystalized and pure sugar resulted. Now, in the large way, I advise the following method of manufacturing maple sugar. Obtain several large copper or brass kettles, and set them up in a row, either by tripods with iron rings, or by hanging them on a cross bar, clean them well, then collect the sap in buckets, if possible, so that but little rain water will be mixed with the sap, and take care not to have any dead leaves in it. For every gallon of the maple sap *add one measured ounce* of clear lime-water, pass the sap into the first kettle and evaporate; then, when it is reduced to about one-half, dip it out into the second kettle, and skim it each time; then into the next, and so on until it has reached the last, where it is reduced to sirup, and then may be thrown into a trough, and granulated by beating it up with an oar.

As soon as the first kettle is nearly empty, pour in a new lot of the sap, and so continue working it forward exactly after the manner of the West India sugar-boilers. The crude sugar may be refined subsequently, or at the time of casting it into the cones made of sheet iron, well painted with white lead and boiled linseed oil, and thoroughly dried, so that no paint may come off. These cones are to be stopped at first, until the sugar is cold; then remove the stopper, and pour on the base of the cone a quantity of

strong whiskey, or fourth proof rum. Allow this to filtrate through, until the sugar is white; dry the loaf, and redissolve it in boiling hot water, and evaporate it until it becomes dense enough to crystalize. Now pour it into the cones again, and let it harden. If any color remains, pour a saturated solution of refined white sugar on the base of the cone, and this sirup will remove all traces of color from the loaf.

One gallon of pasture maple sap yielded 3,451 grains of pure sugar. One gallon of the juice of the sugar cane yields, on an average, in Jamaica, 7,000 grains of sugar. Hence it will appear that maple sap is very nearly half as sweet as cane juice; and since the maple requires no outlay for its cultivation, and the process may be carried on when there is little else to be done, the manufacture of maple sugar is destined to become an important department of rural economy. It is well known, by the report on the statistics of the United States, that Vermont ranks next to Louisiana as a sugar State, producing (if I recollect correctly) 6,000,000 of pounds in some seasons, though the business is now carried on in a very rude way, without any apparatus, and with no great chemical skill; so that only a very impure kind of sugar is made, which, on account of its peculiar flavor, has not found its way into common use, for sweetening tea and coffee. It would appear worth while, then, to improve this manufacture, and to make the maple sugar equal to any now in use. This can be readily accomplished, if the farmers in the back country will study the process of sugar making, for cane and maple sugar are, when pure, absolutely identical.

It should be remarked, that forest maples do not produce so much sugar as those grown in open fields or in groves, where they have more light, the underbrush being cleared away.

In Farmington, on the Sandy river, in Maine, I have seen a very fine grove of maples but 30 years old, which produced a large yield of very good sugar. A man and two boys made 1,500 lbs. of sugar from the sap of these trees in a single sugar season. The sap was boiled down in potash kettles, which were scoured bright with vinegar and sand. The sugar was of a fine yellow color, and well crystalized. It was drained of its molasses in casks, with a false bottom perforated with small holes—the cask having a hole bored at the bottom, with a tow plug placed loosely in it, to conduct off the molasses. This method is a good one, but the sap ought to be limed in boiling, as I have described; then it will not attach to the iron or copper boilers. The latter metal must not be used with acid sirup, for copper salts are poisonous.

Those who fear to trust alcohol on their premises, may content themselves with the use of lime-water to neutralize the acid, and clarify the sirup with eggs or skim milk. Then granulate the raw sugar as usual. To refine it without alcohol, it may be re-melted, cast into cones, drained, and then clayed; or, still better, refined by the displacement of the molasses by means of a saturated solution of loaf sugar poured on the base of the cone after removal of the plug from its apex. Although this process does not give so white a sugar, I should prefer it to any risk of an improper use of alcohol; and it has the advantage of giving a much better molasses, which will do for family use; whereas the rum and molasses is a vile compound, unfit for any use but distilling or for making vinegar.

Any portion of the above remarks you may deem interesting to the public, you are at liberty to publish. Yours, respectfully,

C. T. JACKSON.

Boston, 1844.

G.

UNBURNT BRICK HOUSES.

[From the British American Cultivator, Toronto, U. C.]

Houses properly constructed of this material are warmer, more durable, nd cheaper than frame, and are destined to take the place of the log shanty, s well as the more expensive wooden walls. They are admirably adapted the peculiar circumstances of Canadian settlers, as they neither require uch skill nor expenditure to erect them. Those who profess to be the est acquainted with the subject, are of opinion that they are best calcu-ted for cottages, or buildings that are not designed to be carried higher ian fifteen feet. The great difficulty in high walls built with mud brick, , that the rough casting, or outer coat of plaster, is subject to fall off; the eal cause of which has been heretofore overlooked. This falling off pro-eeds from the fact that the ingredients composing the plaster are not prop-rly compounded and tempered so as to cause the surface to be impervious o water. By examining plastered walls minutely, there may be seen small pertures, which act as so many receptacles to receive the water. The dif-erence between burnt and unburnt brick is simply this: the one becomes oluted the moment it comes in contact with water, and the other admits he moisture without becoming dissolved. Clay or unburnt brick houses re much more wholesome for either man or beast than either burnt brick r stone, in consequence of their having less affinity to moisture. Burnt rick are extremely porous, and each brick freshly taken from the kiln will dmit one third of its weight of water. From these facts, then, it would ppear that the only difficulty in the way in bringing mud or unburnt rick houses into general use, is the liability of the plaster to fall off. We eel satisfied that two very successful plans might be practised—the one to uild a verandah around the whole building; and the other, by compound-ng the ingredients which compose the plaster, so as to form a close, solid, and impenetrable surface. A plaster may be formed with an equal propor-tion of pure clay, sand, ashes, and lime, thoroughly incorporated together, and mixed with a portion of fresh bullock's blood, equal to one half of each of the above ingredients. The blood should be well stirred, to prevent it from coagulating.

To those who have already built, and are apprehensive that the plaster-ing exposed to the action of the changes of the weather will not prove du-rable, we advise them to make a composition of the following materials, and apply it, while hot, on the outer surface with a common painter's brush:

To five gallons of water, add five quarts of Liverpool or rock salt; boil and skim; then take six quarts of unslaked lime, slake and sift it, put it into the hot brine; also, one pound of alum, half a pound of cop-peras, three-quarters of a pound of pearlash—the last to be added gradually; then add four quarts of fine pure sand; mix the whole together, and apply two coats as above. Any coloring matter may be added, to give the shade required. If this process be properly performed, it will make the wall have the appearance of slate, and be remarkably durable.

The mode of making brick is very simple. The first step is to make a clay pit in an oval shape, and fill it with pure clay. Blue is the best, if procurable. As soon as this is done, water should be copiously applied; and after the clay has been saturated with water twenty-four hours, a yoke

of oxen may tread or temper it; and, during this operation, short straw must be applied, at the rate of four common bundles to a hundred bricks. The bricks are moulded quite convenient to the pit, by simply placing the mould on the ground, which should have an even surface, and filling it with the tempered mortar with a common three-pronged fork. By drawing a straight-edge board across the upper surface of the mould, and raising the mould, the brick is formed; which must remain on the spot until it becomes sufficiently dry to turn on its edge. When they are dry enough to move without spoiling the shape, they may be stacked up to season, and should be secured from the wet by broad boards.

In constructing this style of houses, the two following particulars must be invariably observed, viz: The erection of a substantial stone wall, at least two feet above the level of the ground, and a hip or cottage roof projecting over each side of the wall not less than thirty inches. Another very important feature is, to have a quantity of bond timber interspersed through the wall, consisting of $1\frac{1}{2}$ inch or 2-inch plank. To give our readers some idea of the costs of such walls, when they are given out by contract, we will illustrate the subject by mentioning the following facts:

Mr. William Beason, of the village of Yorkville, one mile north of this city, has built a very great number of these buildings, and has invariably taken them by contract at the rate of £1 per hundred brick, including making and laying the bricks, being six inches thick, twelve inches wide, and eighteen inches long. He built, the last summer, a number of houses of various sizes, one of which was for a farmer by the name of Robert Masharfey, of the township of York, the dimensions being twenty-eight feet wide by thirty-eight feet long and fourteen feet high, exclusive of two feet of stone wall for the foundation. The number of bricks in the wall (windows excepted) was two thousand two hundred and forty-eight, which, at £1 per hundred brick, would equal £22 10*s*. There were eleven toises of stone required for the foundation, which cost six shillings per toise for laying into wall. About one-half the quantity of mortar is used for plastering on mud brick that is required on lathing; and the plasterers will do the work for thirty per cent. less than on the latter. The chimneys and inside walls are very frequently made of the same material, but the bricks are much smaller. Any size may be used; but the most convenient and expeditious size for building is six inches thick, six inches wide, and from twelve to eighteen inches long: the bottom and top of the chimney have, of course, to be built with burnt brick or stone. The only cement used for laying up the brick, is an equal proportion of pure clay and sand mixed to the consistence of mortar.

Extract from the British American Cultivator, (Upper Canada,) March, 1843.

We received, a few days since, a note from a friend of ours, who resides in the Brock district, in which he desires further information relative to the mode of constructing the above cheap, durable, and warm houses. We heartily respond to the call; and take pleasure in not only answering his inquiries, but will give such additional facts as suggest themselves to our mind at the present moment. And if any other inquiries are made by the same, or any other respectable party, on the above—or, in fact, any other subject upon which we feel competent to give correct and satisfactory answers—we would take a pleasure in disposing of them in the same way.

The bricks referred to, for the construction of the inside walls and chimneys, may be made of almost any size to suit the taste and convenience of the builder; but the dimensions we gave in our last are decidedly the most preferable, and are sometimes used for outside walls when the building is not more than one story high. The whole of the chimneys for two-story houses may be built with unburnt brick, excepting the fire-places as high as the mantel-pieces; and the portion of the chimneys that project above the roof, joining on to it, be made so that it will not admit any water to reach the clay, (unburnt brick.)

The principal object of bond timber is to attach fixtures to the wall—such as verandahs, door and window sills, base and surbase, &c.; and no danger need be apprehended respecting their rotting, as the walls would have to be made impervious to water, to insure their durability. It is obvious, when wood is thus secured from that devouring element, that it would remain sound for centuries.

Two-story houses require four pieces of timber, at least four inches thick, sawed or hewn out the exact length and width of the building, which should be laid into the wall for the rafters of the verandah to rest upon, and should be laid about one inch within the outer edge of the wall. The rafters of the verandah should be attached to the lower edge of these timbers, and they, as well as all other outside bond timber, should be lathed with ordinary lathing; and, by this precaution, the plastering will remain as sound on the timber as on any portion of the building.

October is the best month in the year for plastering outside walls, as it would be dried principally by the air, which would make the process more slow and perfect.

Dr. Drury, an English gentleman, built a house on his farm on Yonge street, twelve miles from this city, in the summer of 1836, which was neither plastered nor protected with a verandah until the fall of 1838; and the wall, to all appearance, is as sound as the hardest granite. This building is fifty feet long, thirty-six feet wide, and proportionably high, and certainly has the most imposing and respectable exterior show of any farm building in the home district.

We do not recommend this description of buildings to be raised very high in the wall, although but little apprehension need be entertained, if at least one experienced workman be employed about the job.

A false notion has gained ground with many, respecting the tempering of the clay, in supposing that but little care need be bestowed on that department of the business; whereas nearly the same minuteness should be observed as for burnt brick, with the exception that small stone or gravel do not materially injure them, and, therefore, need not be separated from it.

We highly recommend unburnt brick for the construction of sheds and stables for stock, and for every description of out-buildings that are desirable for the comfort of man and beast.

H.

Report of M. Dumas to the French Academy, on M. Boucherie's process of preserving wood: translated by Edward Tilghman, C. E.

The academy having charged MM. Arago, de Mirable, Poncelet, Gam-

bey, Audom, Boussinngault, and myself, with the examination of the memoir of Dr. Boucherie on the preservation of wood from decay, we proceed to the accomplishment of this duty.

The academy has already beheld the preparations of the author with so great an interest—it has, at this moment, such remarkable specimens of the process before its eyes—that the labor of its committee, in some respects at least, is greatly abridged.

Dr. Boucherie proposes to render wood much more durable, to preserve its elasticity, to prevent its warping from alternate exposure to dryness and moisture, to diminish its combustibility, to increase its tenacity and hardness, and, lastly, to give it colors and even odor, the most various and durable. All these requirements are obtained by novel, simple, and economical means, and the aid of common and low-priced materials.

To impregnate an entire tree with the proper coloring, or preservative material, our author has recourse to no complicate mechanical means; he avails himself of the natural suction of the tree itself, which is sufficient to raise from the base to the highest branches the liquids he wishes to introduce, provided that they are maintained at a certain degree of concentration. Thus, when a tree is severed from its roots the end is plunged in the liquid you wish it to imbibe, which, in a few days, ascends to its topmost leaves, and pervades the whole vegetable tissue. It is not essential that the tree should retain all its branches and leaves; a few branches at the top are sufficient to induce the necessary suction. Neither is it requisite that it should always be preserved upright, which would often render the operation impossible. Having cut it down, and deprived it of its useless branches, the butt is then placed in contact with the liquid to be absorbed, which penetrates the wood in every part. Finally, it is not even necessary to fell the tree; for, if a cavity be excavated at its base, or a transverse saw-cut be made through a portion of the base, it will afford sufficient contact with the preservative liquid, and the absorption will be as rapid and complete as before. The impregnation, which is thus effected in a short time, without trouble or expense, will be found to be a different process from those made to impregnate wood already cut, which have been effected by the action of the most powerful machines, or by the prolonged effect of the liquid in which it was submerged. The novel and ingenious process recommended by Dr. Boucherie subjects to human industry an immense natural force, and permits it to introduce, without labor, into the most delicate vegetable tissues, any soluble substance it may be thought useful to place there. If our author has solved the grand problem he proposed to himself, in the most simple and practical manner, he has not evinced less sagacity in the choice of materials necessary to produce the desired effects as to preservation, &c. To increase the durability and hardness of the wood, and to prevent the wet and dry rot, he introduces into its pores the pyrolignite of iron; this substance is chosen, because it is produced by pyroligneous acid, which is to be obtained in any forest where charcoal is made; this acid is easily transformed into pyrolignite of iron, by putting it in contact, even when cold, with old scrap iron. The liquid thus prepared is replete with creosote, which, of itself, without the salt of iron, hardens and preserves wood, as well as defends it from the attack of insects.

Official experiments have been made at the fungus pits at Bordeaux, upon hoops (circles) prepared by the author, which have resulted in estab-

lishing, in the most triumphant manner, the great durability of wood thus embalmed.

The unprepared hoops crumbled to pieces at the least touch, whilst the others were as sound as when first placed there. To prevent the warping of wood, to preserve its elasticity, and diminish its combustibility, our author has recourse to the use of the chlorides, which have nearly the desired effect. Fully impressed with the conviction that his process must shortly come into universal use, he is not content with the chloride of lime, already so cheap; he has experimented on the sea water of the salt marshes —a costless material, in which he has found all the desirable qualities. Wood prepared with these saline solutions, preserves its flexibility, when exposed to the air many years; in their strips, it may be bent and rebent the contrary way in a spiral, without breaking; neither will it crack or warp from the greatest extreme of dryness. Lastly, it will not burn—at least with such difficulty as to be easily extinguished.

To these great and useful properties, which the naval constructor and civil engineer will appreciate and profit by, our author has added others, which, without being so importantly useful, promise to afford new methods and materials to the arts. He colors wood in clouds, so various and so beautifully curious, that the cabinet-maker will find it to his advantage to use the more common woods, in lieu of the more costly. The specimens of these preparations now before the academy relieve us from all detail; it will be sufficient to observe—

That the pyrolignite, when used by itself, produces a brown tint of the same color with those knotty parts of the wood where the liquid cannot penetrate.

When the pyrolignite is succeeded by any tanning liquid, it produces ink in the body of the wood, and we obtain, by these means, a blue-black, or gray. A Prussian blue is caused by the absorption of the pyrolignite immediately by the prussiate of potash.

By introducing successively acetate of lead and chromate of potash, the yellow chromate of lead is produced.

We may produce the most various and beautiful effects by introducing simultaneously the pyrolignite of iron, the prussiate, the acetate of lead, and the chromate of potash, which cause blended clouds of blue, green, yellow, and brown.

Thus we find our author does not confine himself to the introduction of one liquid only, but causes many to enter the same vegetable, and thus produces any modification of color he may wish; these solutions, causing such diversity of color, may be varied almost to infinity. Chemistry is rich enough in creations of this kind, to satisfy the most fastidious caprice. We will not here speak of rendering wood odoriferous by impregnations of this nature; it is an application too easily understood, and too much confined to mere luxury, to compare in importance with the more useful details already given.

I.

MORSE'S ELECTRO-MAGNETIC TELEGRAPH.

The electro-magnet is the basis upon which this whole invention rests in its present construction; without it, it would entirely fail. The electro-magnet is produced by coiling around a bar of soft iron, made in the form of a horse-shoe, (fig. 1,) copper-wire previously covered, similar to bonnet-wire, and

Fig. 1.

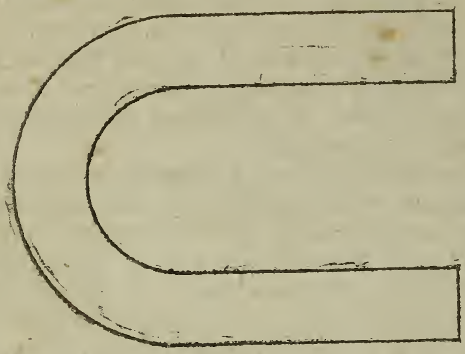
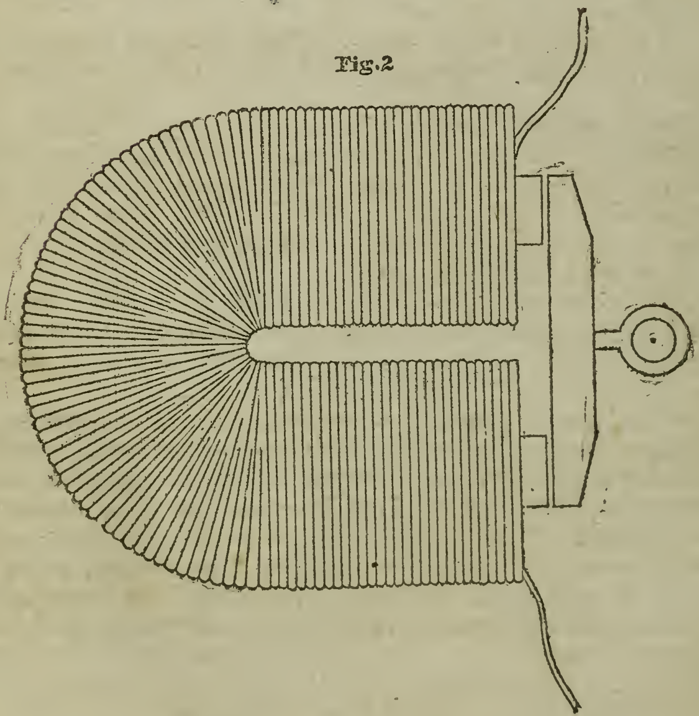


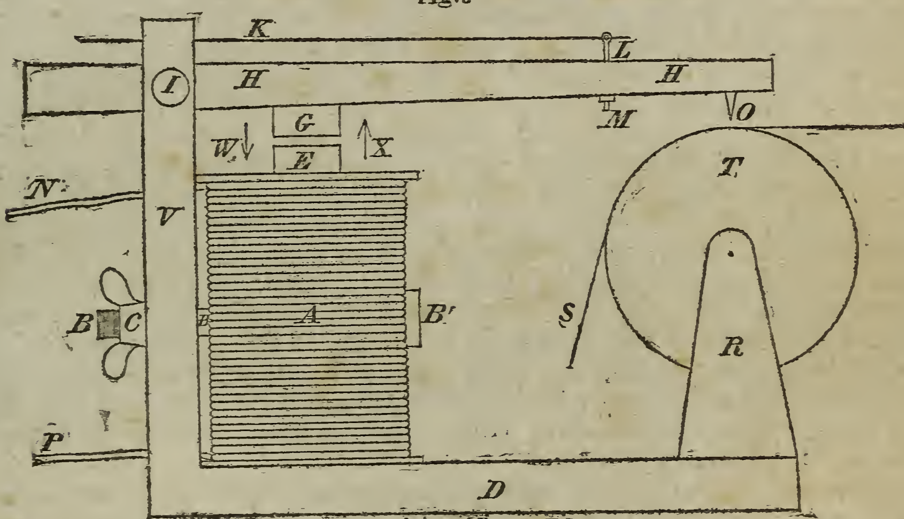
Fig. 2



varnished to prevent metallic contact with each other and the iron, (fig. 2.) The two terminations of the wire thus surrounding the iron in a spiral form, are brought out at each end of the curved bar, and are connected, one with the zinc pole of a galvanic battery, the other with the platinum; the battery being prepared in the usual manner with its corroding acid, produces gal-

vanic electricity, which starts off from one pole of the battery, follows the wire around the soft iron, and returns to the other pole of the battery by the other wire—thus forming a complete circuit. The galvanic fluid is now passing the whole length of the wire, and, while thus passing, the curved iron becomes a strong magnet. By connecting the two ends of the bent iron with a bar of similar soft iron, it will support many pounds weight. If, while in this condition, one of the wires is removed from the battery, the cross bar falls, and with it its weights. The curved iron returns instantly to its original state. It is unmagnetized. Complete the circuit, as at first, and in an instant it is again a magnet. Break the circuit, and it ceases to be a magnet. If the battery is placed 100, or 1,000, or 10,000 feet from the magnet, yet, when the one is connected with the other by intervening wires, the effect upon the magnet is the same—making it a magnet when the circuit is complete, and *vice versa* when it is broken. In this way, power is produced at a point of considerable distance from the generating agent, and wholly at the command of the operator at the battery to make or destroy the power produced with the utmost possible rapidity.

Fig. 3



The above figure represents the most simple form of the electro-magnet, with its appropriate machinery for telegraphic purposes. A, represents a side view of the bent iron bar, surrounded with its coils of copper wire, standing upon a platform D. V, being an upright arm secured to D, to which the magnet, or soft iron, is permanently fastened by means of the bolt B B B passing between the prongs of the curved iron, and through the board V, and adjusting screw C. E, is the projecting prong of the iron after it has passed through the coils—one only being seen. The other prong is directly behind E. G, represents the end of the iron bar, or keeper, extending back so far as to cover both the projecting ends of the horseshoe formed magnet. This iron bar, or keeper, is fastened to the lever H H, which is delicately adjusted so as to rise and fall by a pivot at I. K, represents a steel spring over the lever H H, and passes through a loophole L, formed from a brass wire; the lower part of the brass wire being secured to the lever H H, by means of a screw at M. O, is a hardened steel point, similar to those used by manifold letter-writers, and is also connected

with the lever H H, and directly over the centre of the metallic roller T, in which a slight groove is made to correspond with the point of O. R, represents the standard in which the axis of the roller T freely revolves, and is a part of D. The line S represents the paper, in form of a ribbon, passing from its coil between the roller and the point of O. N and P are the two extremities of the wire upon the magnet, A. Every part is now described, and, from what has preceded the description, bearing in mind the effect of the battery when in action upon the soft iron, by forming a complete circuit with the wires N and P, the mode of writing by the instrument may be easily comprehended by what follows. Complete the circuit, and instantly the cross-bar G approaches the ends of the *magnet* E, until they meet in the direction of arrow W. Break the circuit, and G is carried up in the direction of arrow X, by means of the spring K. If to the roller T clock-work is attached, to give it a uniform movement upon its axis, the paper S will move with the same uniform motion under the point O; then, by completing the circuit, the point O is brought down upon the paper, which is indented to such a degree as to make it perfectly apparent, and continues to mark it in that manner so long as the circuit is closed; but, upon breaking the circuit, the marking ceases, and the point O flies from the paper, which continues passing on. If the circuit is closed and broken with the utmost rapidity, then a succession of dots and spaces upon the paper appears. If the circuit is successively closed and broken with less rapidity, short lines and intervening short spaces are made. If closed for a longer time and broken in succession, then the marks become longer; so that dots, short lines, long lines, and short or long spaces, are made according to the time the circuit is closed, and the rapidity with which the paper moves under the pen. An arbitrary arrangement of these dots, short and long spaces and lines, constitutes the telegraphic alphabet; by means of which intelligence to any extent is communicated. Thus one dot may represent A, two dots B, three dots C, one dot and a line D, &c. The paper to be imprinted is fixed upon a revolving cylinder, and records despatches day and night; and this without ink, as the impressions are easily read even by the blind. The records of the night continue entered on the morning. The alphabet is easily learned.

We have said that the best mode of laying the conductors is not yet decided upon, whether beneath the ground in pipes, or above the ground upon poles—a plan early proposed by Professor Morse, in the report to Congress in 1838. Probably both modes, to a certain extent, according to circumstances, will be adopted.

"Twenty miles, on the Great Western railway in England, have been laid down, and brought into operation in May last. A double line is also laid down on the Blackwall railway, and others on the Leeds and Manchester, and Edinburgh and Glasgow railways."

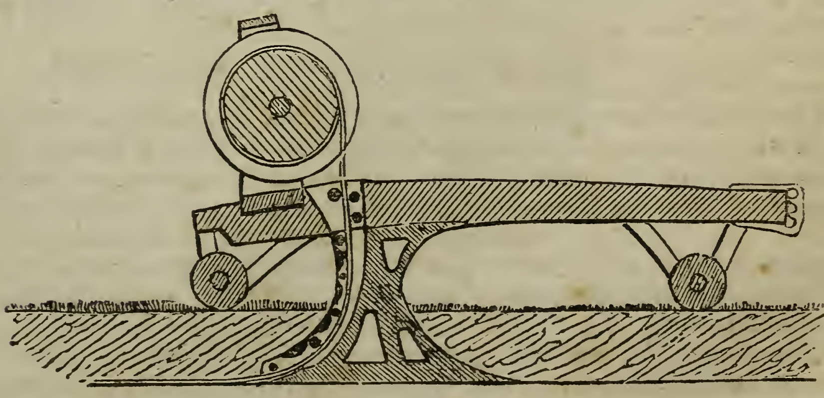
"More recently, Mr. Cooke, after extensive experiments at his own residence, carried out, on the Great Western railway, a plan of suspending the conducting-wires in the open air, from lofty poles. Its leading advantages are—1st. Diminishing cost; 2d. Superior insulation; 3d. Facility of repair. The old plan consisted of laying copper wires, covered with cotton, and carefully varnished, into smooth iron tubes, with frequent arrangements for obtaining access to the wires, and for the facility of examination and repairs. The tube, after being carefully tarred, was either buried in the ground, or fixed on low posts and covered with a wooden rail. This plan

will still be occasionally applied, in conjunction with the new one, in tunnels, towns, &c.

"The last advantage which need be noticed, in connexion with this important step (placing on poles) in the invention, arises from the very perfect insulation from the earth. This allows of the employment as half of the conducting circuit, without risk of the current finding a shorter course through some imperfectly insulated point. For nearly two years, Mr. Cooke has tried this plan successfully on the Blackwall railway, and since on the Manchester and Leeds railway; but, when the wires are enclosed in an iron pipe, there is always danger of a contact—either partial, from a few drops of moisture, or perfect, from the metals of the wire and pipe touching; in which case, the electricity takes a shorter course, instead of performing its entire circuit, and no signal is given at the distant terminus, though appearing very strong at the point whence it sets out. With the wires suspended in the air, no such danger exists; whilst two advantages spring from the employment of the earth as a conductor—1st. One wire is saved in each circuit, thus diminishing complexity and cost; 2d. The earth, acting as a great reservoir of electricity, or, as some think, as an excellent conductor, the resistance offered to the transmission of electricity is vastly diminished, and the battery is able to work through a much greater distance with a small conducting-wire."—*Civil Engineer and Architect's Journal, June* 1843, *page* 21.

The following experiment, recently tried at Washington, shows, in an interesting manner, the rapidity with which intelligence is transmitted. As the train of cars was coming from Baltimore, a person stationed 4 miles off, at the instant the locomotive was opposite to him, gave notice of the fact that the cars were coming; and this news was received, and the acknowledgment of its reception at Washington returned, before the last car of the train had passed. As each circuit, to be complete, must, in both cases, reach from one end to the other, and back, the whole distance, thus traversed in the time mentioned above, must have been 16 miles, besides the stopping of the machinery.

K.



The above cut represents an invention of merit and simplicity for laying lead pipes in the earth by animal power, and without excavation by hand,

It is unnecessary to describe the operation, as it must be obvious from the inspection of the cut, which represents a profile or side view of the machine, with one side taken off, so as to exhibit the interior curvature through which the lead pipe passes from the drum, on which it is coiled, into the earth beneath. The thickness of the share, made of cast iron, is in proportion to the size of the pipe desired to be laid; and, of course, it is moved through the earth with corresponding ease, causing but a narrow cut or crack in the earth, which readily closes as the machine advances; the pipe being left at the bottom of the trench, or as deep in the ground as the machine was gauged to run, by an adjustment of the wheels. It is the invention of Mr. Ezra Cornell, of Ithaca, New York, suggested originally for the purpose of laying pipe for Professor Morse's telegraph, but is adapted no less to the laying of lead pipe for conducting water. The pipe for the telegraph has been laid by it for the distance of about ten miles on the railroad from Baltimore to this city. In illustration of the rapidity and success of its work, four hundred and fifty feet of pipe was laid, at the depth of twenty inches, and completely covered in the short time of five minutes, including one stop of nearly three minutes. It is estimated that three miles of pipe can be easily laid in a day with this machine, when the ground is free from obstruction, requiring a team of from two to four yoke of oxen or spans of horses, according to the nature of the soil and depth at which the pipe is laid. One may readily imagine that the power requisite to move so thin a blade as this instrument has, through all ordinary soils, cannot be great. To the agriculturist this invention is deemed important, as affording facilities for irrigation or watering his stock; more especially since lead pipe is now made with the rapidity of three miles in length per day, and at an actual expense not exceeding one-half cent per pound, and is now afforded in quantities at $5 per hundredweight—a great contrast to former years, when it was imported from Europe, previous to the late American invention.

ARTS AND SCIENCES.

E.

Report of the First Examiner on the Arts.

Patent Office, *January* 31, 1844.

Sir: In conformity with your directions, I have prepared, and have the honor to submit, the following report on the general progress of inventions, within the range of the classes confided to my charge as examiner. These classes are—

1st. Metallurgy and the manufacture of metals.
2d. Manufacture of fibrous and textile substances.
3d. Steam and gas engines.
4th. Navigation and marine implements.
5th. Civil engineering and architecture.
6th. Land conveyance.
7th. Milling and all kinds of mills.
8th. Machinery for manufacturing and working lumber.
9th. Fire-arms and implements of war.
10th. Miscellaneous.

The short space of time allotted to me for the preparation of this report will not permit me to trace up minutely the progress of the manufacturing and domestic arts above enumerated. A work of such value and importance to every branch of industry as would be a report on the progress of the useful arts, with a careful review of the causes which lead to, and the difficulties removed by the introduction of new inventions, together with the influence which the progress of abstract science has exercised on the progress of the useful arts, would require an amount of labor and time not within my control at present; and, therefore, I shall be under the necessity of limiting this report to a mere sketch, or general view of the progress of the useful arts within the last few years. In doing this, I shall avoid, as much as possible, all technicalities, and thus endeavor to make it acceptable to the general reader.

1st. METALLURGY AND THE MANUFACTURE OF METALS.

This class includes the processes and methods of reducing all the metals from the ores to a condition fit for their application to useful purposes, and preparatory to *manufacturing;* which includes all the processes and mechanism for working these metals into the various forms adapted to the wants of life in the advancing condition of civilization.

As iron enters more extensively into the various uses of man, and has conduced more than any other product of nature, when submitted to art, to the various phases of civilization, so it has more than any other received contributions from the genius of man. Most of the inventions made and patented in this country in metallurgy—and, I may say, all the important ones—have been devoted to the various operations of reducing iron from the ore to the metallic state. When we consider that the United States manufacture annually not less than 300,000 tons of cast, and 200,000 tons of bar or

malleable iron, the importance of any invention which reduces the expense of producing it, whether by lessening the consumption of fuel, the original cost of the works, or the amount of manual labor, will be duly appreciated. But this is not all; it should also be considered that every invention of this kind brings us nearer into competition with the European manufacturer, and, judging of the future by the past, we have every reason to anticipate that, in a few years, by the progress of improvements, the American iron manufacturer will not only be able to compete with the foreign manufacturer of iron in the markets of the United States, but abroad also; thus making available, as a source of national wealth, the inexhaustible supply of iron ore and mineral coal within the limits of the United States.

The inventions made in England, during the eighteenth century, to reduce iron ore to the metallic state by the use of stone or mineral coal, instead of wood, produced an entire revolution in that branch of trade, and has made it one of the most important sources of British wealth. We must look for a similar change in our favor to the reduction of labor and fuel by the introduction of new inventions having these objects in view.

Within the last few years, much progress has been made towards this end —enough, at all events, to feed the hopes of the least sanguine. Amongst these improvements, may be enumerated various methods of arranging steam-boilers so as to generate steam for the steam-engines employed to work the bellows, and perform other operations connected with an iron manufactory, by the waste heat of the smelting and other furnaces. These were extensively and beneficially introduced; and, of late, a bolder and more important step has been taken, which will greatly reduce the cost of fuel. It is the employment of the combustible gases, which escape from the upper part or chimney of the furnaces in an unconsumed state, to be wasted in the atmosphere, to the purposes of puddling, refining, and other operations previously requiring the use of great quantities of fuel. By the introduction of this improvement, there is saved to the manufacturer not only the cost of the fuel, which is thus substituted, but the manual labor necessary to supply the fuel and feed the furnaces or other apparatus; and it should also be remembered that, by the use of these gases, are avoided most of the difficulties arising from the impurities always contained in stone or mineral coal, whether bituminous or anthracite, but more particularly the latter, which affect the quality of the iron, and which have so perplexed the ironmaster, and retarded the introduction of mineral as a substitute for vegetable coal.

The use of gases escaping from the chimneys of furnaces illustrates, in a very striking manner, the gradual progress of inventions, and the dependence of the useful arts on the progress of science. The first step was to apply the gases which escape from the furnace in a highly heated state, by conducting them through the flues of boilers, and thus generate steam; and when subsequently the heated blast was introduced, (which will be spoken of hereafter,) these gases were employed to heat the air in its passage to the furnace. When chemical science, however, turned its searching and analytical inquiries to this branch of the arts, new light was thrown upon it; and the practical man was soon taught that these gases, instead of being pure products of combustion, and non-combustible or carbonic acid gas, are carbonic oxide and carburetted hydrogen, combustible gases, and that for ages the ironmaster had been wasting immense quantities of fuel, in the form of invisible gases and smoke. This at once opened another field to the inventor; he directed his attention to the condition under which these gases escape, and found that they could be taken from the chimney at a sufficiently

high temperature to unite with the oxygen of the atmosphere, when the two are brought in contact, and thus to inflame or burn, and give out an amount of heat far beyond that of its temperature when it escaped from the chimney. Means were then contrived for conducting and burning these gases in the furnaces, &c., to be heated. This important invention is being introduced in our furnaces, and will produce an important change.

I have above hinted at the introduction of the heated blast as an important step in the progress of metallurgy. Prior to this suggestion, the intense heat required to smelt iron was acquired by exciting the combustion of the fuel with a powerful blast of cold air, which, coming in contact with the incandescent coals in the furnace, had to be heated by the fire itself, before the chemical union, called combustion, could take place. It soon became evident, therefore, that if the air for the blast could be heated by the heat which necessarily escapes from the furnace, the amount of caloric between the temperature of the cold and the hot air would be saved, and that a higher degree of temperature could be developed in the furnace, in the same space of time, with the hot than with the cold blast. This led to the invention of various methods of constructing furnaces, and of arranging the air-pipes, to make available all the heat which necessarily escapes through the sides of the furnaces, (constructed, as they must be, of materials not perfectly non conducting,) and with the heated gases and smoke.

The great quantities of anthracite coal in the iron regions of the United States and England led to many suggestions and experiments to render the application of this kind of coal as useful in the reduction of iron ore as had been the application of bituminous coal. For many years these efforts proved unsuccessful, notwithstanding the numerous and high premiums offered for the plan that would effect this desirable object. It had been tried in every imaginable form of furnace, with the cold blast and with the hot blast; and, finally, when the efforts were generally abandoned, and it was about to be pronounced one of the impossibilities, the discovery of the application of the hot blast, *under heavy pressure*, accomplished the desirable object. This has been extensively applied in England, and to some extent in the United States; but the iron is said to be inferior to that made with bituminous coal, and, therefore, a wide field is still open to the inventor and experimenter; although I am of opinion that the application of the escaping gases, for the refining processes, will enable the ironmaster to produce, after a little experience, iron of the best qualities with the anthracite. This is a subject of momentous importance to every branch of industry, and of peculiar interest to the political economist, in view of the vast resources of the country.

Several patents have been granted in the United States and in Europe for processes to reduce iron ore to the metallic state without smelting, by extracting the mineralizer and all foreign matter from the ore, by chemical agents; which, if successful, will greatly simplify the operation, reduce the cost of manufacturing wrought iron and steel, and greatly improve the quality of the metal produced; as, by it, the metal is not subjected to the injurious temperature required for the smelting process.

Should these processes prove successful, (and few of the inventions now established gave such fair promises at first,) they will establish a new era in this branch of the arts, and bring the manufacture of iron more within the reach of small establishments than the methods now practised.

Many improvements have been made for various modifications of the

furnaces employed in smelting, refining, puddling, and other operations in the processes of reducing iron ore into cast, and cast into bar iron and steel; in the blowing engines for supplying the blast, cold or hot, to these furnaces—particularly by the introduction of the rotary fan-blower; and also in the construction of the apertures, or tuyéres, through which the blast is admitted to furnaces and forge fires. And although, amongst these, may not be found any of those great leading improvements which mark an era in the history of inventions and the progress of the useful arts and manufactures, yet, when taken in the aggregate, the amount of benefit arising from them, when carefully considered, is astonishing.

I have so far called your attention to metallurgy proper, belonging to chemical science, and over which it presides, and coming only within the range of mechanical science in the construction and management of the mechanical means necessarily connected with it. And, before passing over to the manufacture of metals, it is proper to speak of some few, but very important, improvements which have been made in the stupendous engines employed in changing cast into malleable or bar iron.

For a long time after the manufacture of iron became one of the leading products of British industry and ingenuity, the balls of cast iron, called "puddler's balls," were wholly acted upon, and the impurities forced out, the metal concentrated and reduced to the condition for rolling into bars, by the slow process of hammering with heavy trip or tilt hammers. This branch of the operation was greatly improved by the genius of Mr. Cort, who substituted for this slow and tedious operation what are known as the *roughing rollers*. This machine consists of two large rollers, between which the "puddler's balls" are rolled, the impurities squeezed out, the metal concentrated, and thus prepared for rolling into bars. The operation of hammering, which was necessarily very slow, required the balls to be re-heated several times, whilst by this improvement the whole is performed at one operation. This machine has been of late greatly improved, by substituting for these two rollers a cylinder, working within a concave bed extending around the semi-diameter of, and placed eccentric to, the cylinder, in such a manner as to receive the "puddler's balls" at one side, and discharge them on the other, in a condition for the rolling-mill. The apparent advantages of this over Mr. Cort's method is the more regular and rapid action, and the delivery of the iron in a better condition for the rolling-mill.

Although, in the general, these methods of rolling "puddler's balls" are vastly superior to the old methods of hammering, many ironmasters—whether from reasons not fully understood, or from that love of antique and long-tested methods which has always presented a barrier and dammed in the tide of improvement until swept away by the force of reason—continue to use the hammering method. This has led to an improvement in the manner of working forge-hammers, which is as useful as it is simple and ingenious, and which is of vastly more importance in forging large masses of iron, such as heavy shafts, anchors, &c., than in its application to the making of wrought iron. It consists simply in attaching the heavy hammer to a piston working in a cylinder, and actuated by the force of steam, the admission of which is regulated by a lever valve, operated by the hand of the attendant, who thus can regulate the force of the blow at his discretion, to suit the condition of the work by the quantity of steam admitted.

The *manufacture* of metals, which forms the second branch of the first class, includes all the machines employed in fashioning metals into any form suited to the wants of society and the arts, as also the making of various tools or implements composed wholly or chiefly of metal. This has been one of the most prolific branches of American industry and ingenuity; and I regret that time and space will not permit me to give a full and detailed review of its progress.

Of nails.—To the United States are due the invention and introduction of cut nails, and the power-machines which cut and head them with such astonishing rapidity. The following extract from the writings of the celebrated Dr. Ure will show in what high estimation this branch of purely American industry is held in England:

"As nails are objects of prodigious consumption in building their block houses, the citizens of the United States very early turned their mechanical genius to good account in the construction of various machines for making them. So long since as the year 1810, it appears, from the report of the Secretary of the Treasury, that they possessed a machine which performed the cutting and heading at one operation, with such rapidity that it could turn out upwards of 100 nails per minute. 'Twenty years ago,' says the Secretary of the State of Massachusetts in that report, 'some men, then unknown and then in obscurity, began by cutting slices out of old hoops, and, by a common vice griping these pieces, headed them with several strokes of the hammer. By progressive improvements, slitting mills were built, and the shears and the heading tools were perfected; yet much labor and expense were requisite to make nails. In a little time, Jacob Perkins, Jonathan Ellis, and a few others, put into execution the thought of cutting and heading nails by water power; but, being more intent upon their machinery than upon their pecuniary affairs, they were unable to prosecute the business. At different times, other men have spent fortunes in improvements; and it may be said, with truth, that more than $1,000,000 has been expended. But, at length, these joint efforts are crowned with complete success, and we are now able to manufacture at about one-third of the expense that wrought nails can be manufactured for—nails which are superior to them for at least three-fourths of the purposes to which nails are applied, and for most of those purposes they are full as good. The machines made use of Odiorne; those invented by Jonathan Ellis and a few others present very fine specimens of American genius.'"

The manufacture of wrought nails in the United States, which, for some purposes, cannot be substituted by cut nails, because of their brittleness, was so limited, in consequence of the expense of performing the whole operation by hand, that, until a few years since, it was scarcely worthy of consideration; but, after many attempts, machines were finally invented, and are now in successful operation, for making this kind of nails with no more hand labor than is necessary to supply the rod of iron to the machine, which completes the nail by a series of connected operations: cutting off the piece from the bar, rolling it into the required form, and then forming the head. These machines have been very successfully applied to the making of large nails, called spikes, employed in frame structures and in ship-building. When these machines, however, were applied to the making of what are termed "hook-headed spikes"—that is, a spike with the head all on one side, used for fastening the iron rails of railroads—it was found that the head, formed by simply bending over the metal, was not sufficiently strong to

resist the jar to which they were subjected, and therefore were inferior to those made by hand, and strengthened at the head by the skill of the workman. This difficulty, however, soon yielded to enterprise and ingenuity; and machine-made spikes are now preferred to those made by hand. These simple and successful improvements cannot be dwelt upon too much, as they indicate that important results are generally attained by the simplest means. Instead of bending the head entirely over at one operation, the part of the metal of which the head is formed is only bent over to form an angle of about 30 degrees with the shank of the nail, and then it is struck by a second die moving in a line, or nearly so, with the shank, which finishes the head, and forces or concentrates the metal in the angle uniting the head and shank—thus giving all the requisite strength where it is required. As the brittleness of the cut nail constitutes its inferiority in one respect, and its sharp and serrated edges its superiority in another respect, to the wrought nail—the former being due to the fact that the length of the nail is formed from the breadth of the bar from which it is cut; and the latter, because it is cut by a sharp instrument, instead of being rolled or hammered—many attempts have been made to make nails which would have the combined advantages of the cut and wrought, by rolling the bars or rods from which the nails are to be cut, of the desired form, and then to cut them in the length of the bar, so as to have the grain of the iron run in the length of the nail. I believe, however, that, so far, these attempts have been unsuccessful.

Wood screws.—This branch of manufactures has been struggling on for many years with slow but sure steps towards perfection. While screws were the product of hand labor alone, no serious attempt was made to introduce this branch of manufactures in the United States; but its importance soon led to the invention of machinery in Europe and this country to substitute automatic for manual labor. At first, the screws produced by these machines were very rude, and inferior to those made by hand; but successive improvements have at last so perfected the operation of the machinery, that the screws now manufactured in the United States surpass those made by hand or machinery in any part of the world. The accuracy, rapidity, and perfect finish of the work produced by these machines, are truly surprising, even to the engineer who is accustomed, at every step, to see the giant strides of the mechanic arts in the march of improvement. In close connexion with the manufacture of nails and screws, may be ranged the manufacture of rivets, which are very extensively used by all the workers in iron. These are made by machines similar to those employed in cutting off and forming the heads on what are termed the blanks of wood screws. Rivets have, until very lately, been fastened by the hand hammer—a very slow and tedious process, in riveting together the plates of steam-boilers, large tanks, &c., particularly those requiring to be water, air, or steam tight. But the introduction of a very simple machine has greatly facilitated this operation. There is a bed-die that receives the head of the rivet after the shank has been passed through the hole in the plates to be united, and then a second die, attached to a slide, is forced down on to the end of the rivet, and completely clinches it, forcing the metal into every little crevice, and finishing the whole operation at one single stroke.

Of the manufacture of pins.—Until a few years since, pins, like screws, were wholly the product of hand labor, which rendered their manufacture a European monopoly, hand labor in the United States being too expensive to compete with the low price of labor in Europe. It has, however, like the pre-

ceding branches, yielded to mechanical ingenuity, and large manufactories of this article are now in successful operation in various parts of our country, yielding pins of the best quality, in great quantities. These machines in operation appear to be endowed with human instinct, so regular and so perfect are the various operations performed by them. The wire, wound on a large reel, is put on the machine, and from that time until the pin is delivered with the head and point completed, it is not touched by the hand; and although it has to undergo the various operations of cutting off, forming the head, and grinding and polishing the point, the finished pins drop from the machine as fast as if they had to undergo only one of these operations; for the machine is so regulated, that the moment one has been cut off, it is transferred, as by instinct, to the next operation; which is performed whilst the first operation is repeated on another; and so on, to the completion: there being as many pins in the machine as there are operations to be performed, each pin undergoing one operation.

The sticking of pins in papers, by machinery, has lately been introduced, instead of the slow, tedious, and costly operation of sticking by hand. This invention, lately patented, will produce a considerable saving in the expense of sticking pins. It was necessary in the manufacture of pins, to arrange them with the points all in one direction, the operative doing this by means of an instrument similar to a comb, which is necessarily slow. This operation, like the others, has given way to improvement, and will hereafter be performed by very simple machinery, lately invented. The pins in large quantities are put in a hopper, and are delivered with the points all in the same direction, ready for the sticking machine. Those unacquainted with the practical operation of pin-making, can only realize the importance and economy of such inventions by considering the various operations through which a pin has to pass before it is completed, in connexion with the low price at which it is sold.

Door hinges.—The making of hinges, either of cast or wrought iron, is a branch of manufacturing industry which has made great progress in the United States, and which has been the fruitful source of many valuable and ingenious inventions and improvements. The casting of hinges on to a wrought-iron pin with a free and good joint, is truly one of the triumphs of mechanical ingenuity. One half of the hinge is cast on the wrought-iron pin in a sand mould expressly prepared for it, and afterwards the other half is cast on to it, in such a manner as to chill the surface of the molten iron when it comes in contact with the cold iron of the half first formed, which prevents the two halves from adhering. Many improvements have been patented for various methods of forming the moulds, most of which, I believe, are in successful operation. The price of hinges thus made is, of course, very low, and peculiarly adapted to the condition of this country.

The wrought-iron hinges are made of plate iron, the plates being cut into the required form by powerful steel dies operated by lever power, and the knuckles formed to receive the joint pin by being forced into a die which curls or bends over the knuckles. The parts are then filed, and the pin introduced to unite the two halves. The introduction of this method of making wrought-iron hinges has, of course, greatly reduced the expense of manufacturing them.

Of horse-shoes.—The manufacture of an article of such general and extensive use, the price of which affects so large a portion of the population

of all countries as horse-shoes, at an early period attracted the attention of ingenious manufacturers and mechanics in this country, who made many attempts to render this an automatic instead of a handicraft operation. As early as the year 1809, a patent was granted by this office for a machine for making horse-shoes; but which, from a want of knowledge of the nature of iron, and the manner of working it, did not succeed. Within a few years past, several machines have been patented in England and the United States, that answer the full expectations of the projectors. To one acquainted with the nature of iron, the various operations to be performed in giving the requisite form to a horse-shoe, presents many difficulties; and, therefore, it required a mind of no common order to perfect this automatic operation.

All kinds of tools.—The United States are unrivalled in the manufacture of axes and hatchets, whether as regards the quality of the metal employed, the workmanship, or the adaptation of the form to the various purposes to which they are to be applied. The low price at which they are sold, in view of their quality, is due, principally, to the invention of machinery, by which separate pieces are formed with such accuracy, that, when put together and welded, the axe or hatchet is complete and ready for grinding. In the manufacture of cutlery and edged tools, as well as all other kinds of tools, the reputation of the American manufacturer has become the envy of the European manufacturer; and it has been remarked by all who are acquainted with the mechanic arts, that the tools made in the United States are superior in quality and adaptation to the wants of the mechanic, to those manufactured in any other part of the world.

Of augers, gimblets, and other tools for boring holes in wood.—These instruments are now manufactured in the United States, of a quality superior to any made in other parts of the world, and at a price, compared with their value, which renders their exportation a profitable trade to those engaged in it. Our great success in the manufacture of these articles is due to the invention of machinery for giving the required form to these instruments, which present great difficulties (particularly the twist auger) when made by hand, and to the improvements made in the instruments themselves. The construction of these instruments, to insure accurate cutting and easy delivery of the chips, and at the same time avoid splitting the wood, as also the invention of machinery to make them, have occupied the attention of many ingenious men, who have from time to time secured their inventions by patent. It is gratifying to know that the ingenuity and enterprise of many of these individuals have been crowned with success, and that they have the satisfaction to know that they have been the means of establishing an important branch of industry in their country.

The following extract from Dr. Lardner's Cabinet Cyclopedia will show the extent to which these facts have been admitted. This work was published in 1831; since which time, great progress has been made in every branch of manufactures. But let the extract speak for itself, viz:

"A Kentucky man comes from his woody location to New York, to purchase an axe. He suits himself with one that is heavy enough, and handsome enough, and cheap enough. On reaching home, he proceeds to fit it with a handle; in the performance of this operation, he drives the wood so forcibly into the eye, that the iron, which is rotten, as the workmen say, gives way, and the instrument is, of course, entirely spoiled. The iron, however, is rarely so bad as to burst in this manner; so that, in general,

the axe is carried out into the forest, and applied to its proper use. The woodman presently finds that the steel is so worthless that the edge will not stand at all; it is either friable, and breaks away in small masses, or it is soft, and turns again with the stroke. This is by no means an imaginary case—or, rather, it *was* not; for such articles have brought even reputable British marks into disrepute; and the Kentucky man will not purchase an imported axe at any price, if he can obtain an American one. *These remarks are extorted under a strong feeling of regret*—not that the manufacturers of the United States should have the spirit and wisdom to use good steel which has been expensively refined, but that our own makers should be content to sacrifice on an inferior material their own reputation and the credit of their country. This evil is sufficiently palpable when these useless commodities are sold *bona fide* at a low price; how much is the mischief aggravated when they are palmed on the confiding purchaser as of first rate quality! Nor let it be supposed that the Yankee axes, as they are called, consist, in general, merely of good stuff rudely managed; we have seen within the last few days an axe from an extensive manufactory in Connecticut, which was not only made of excellent materials, but was formed and finished with a degree of perfection that must have convinced any person in the least acquainted with such matters that the maker of such a tool had nothing to learn in his business, and little to fear from competition. It will be obvious that these remarks apply with more or less force to the other articles enumerated above."

The superiority of American tools is still more strongly illustrated by the following extract from the same work, viz: "In the year 1830, about 900 tons of steel (British and foreign) were shipped in the port of London; but how small a proportion that quantity bears to the whole amount converted for foreign consumption, may be inferred from the fact that one house, during the same year, exported to America nearly twice that weight." And again: "It is a lamentable fact, in many respects, that the export trade in the best steel has rapidly increased, since our own makers of hardware goods have been so eager to substitute low priced for superior steel irons; for it is well known that in this, as in other branches of commerce, finished goods of inferior quality form the bulk of our exports, while the foreign manufacturer is supplied with raw materials of the highest intrinsic value. As an illustration of this point, it has been said that there is, probably, ten times as much hoop L (the best quality of steel) sent to America, as is consumed in this country, though the amount of steel used at home is at least fifty times greater than the amount sent to the United States." What a source of gratification it must be to the American manufacturer to find his superiority admitted by the oldest, wealthiest, and most extensive manufacturing nation of the world. The character of the American manufacturer is so well established, that, in many articles, American marks and stamps are forged by European manufacturers. It is sincerely hoped that mere temporary gain will not induce any of them to sacrifice so creditable a reputation.

Locks, and other kinds of fastenings for doors, &c.—The means of giving security to locks (according to an able writer on this subject) are of two sorts: the first consisting in numerous obstacles, called wards, placed in the passage of the key, and therefore requiring a peculiar form in the key to avoid them; and the second consisting in a number of impediments to the motion of the bolt—these impediments being so con-

trived, that their absolute and relative positions must be changed before the bolt can be withdrawn. These are the leading and essential characteristics of the locks now made, and the invention of them belongs to antiquity; the latter having been known more than 4,000 years, as appears from some sculpture on the temple of Karnac, and both have been traced in locks found in the ruins of Pompeii and Herculaneum. They were re-invented in Europe in the 18th century, and greatly improved within a few years. These two characteristics afford very little safety against the skillful picklock, who can either take impressions from which to make a key, or attain his object by a combination of picks. The combination lock of the celebrated Bramah, for many years was proof against the most skillful picklocks. It is based on the second characteristic mentioned above, viz: the use of a number of impediments to the motion of the bolt, and consists in arranging these impediments (or tumblers, as they are commonly called,) so that they and the form of the key can be shifted at pleasure—thus doing away with the possibility of opening such a lock by false keys; for, thus constructed, a lock with 12 tumblers is susceptible of 479,001,500 changes; and, by the addition of 1 more tumbler, the number of changes can be increased to 6,227,019,500. Subsequently, a detector was added to this lock, by which any attempt to open it with a false key would not only increase the difficulty of opening it, but expose the attempt. Many patents have been granted in this and other countries for various modifications of these principles; but it seems that there is no barrier or impediment, however complex, or ingenious, or powerful, which can arrest, permanently, the progress of depraved man towards his wicked end. These locks, strange as it may appear, afford very little security against picklocks; and their only advantage is to increase the danger of detection, in consequence of the length of time required to pick them. It has been found that, by the application of pressure to the bolt, the tumblers, (which, of necessity, are made of materials more or less elastic,) will yield a little, and thus the picklock is enabled to bring them one by one to the position which will permit the bolt to move back; for the moment one of the tumblers is brought to its proper position, it is no longer under the pressure applied to the bolt. Improvements, however, have lately been made, that avoid this indication, and the picklock is again put to the necessity of exercising his misplaced ingenuity to discover another indication.

The locks to which I have called your attention are only, from their complexity and cost, applicable to banks, vaults, safes, &c.; but the locks, latches, and other fastenings applicable to common purposes, have received much attention from the manufacturer and mechanic, in the manner of constructing them, as well as in the quality of the workmanship, and the tools and machinery employed in manufacturing them; and it can be said without fear of contradiction, that the American locks and fastenings are not surpassed, if equalled, by those manufactured in any other part of the world; and, although the first cost is greater, yet they are found much the cheapest in the end. Locks are now made in this country, with all the parts cast of the required form, and without springs, so that they can be sold at a price far below the fragile and miserable locks imported from England.

Lead pipes.—This article has become one of great importance in its connexion with manufactures and domestic economy, particularly in cities lighted by gas, and supplied with water from some great reservoir. Such pipes

were formerly made from sheets of lead bent over and soldered, and, subsequently, by casting them in a mould on a spindle, and then elongated by being passed (whilst on the rod or mandril) between rollers. These two methods were necessarily limited to the making of pipes in very short sections, requiring the plumber to solder the short sections together, with great labor and expense. This gave rise to the invention of a method of making them from molten lead, by forcing the fluid lead through an annular aperture, surrounded by water, to cool the metal and make it set or solidify at the moment of its discharge, and thus to make pipes of any required length; but experience has shown that the pipes thus made are too brittle, and will not stand the pressure to which they are often subjected. A subsequent improvement was made on this method, by allowing the metal to set in the vessel or cylinder containing it, and forcing it out by the application of great force, through a conical die which concentrates the metal. It is now in successful operation in this country; as also another, which has since been the subject of a patent, and which consists of several pairs of drawing rollers—the second pair rotating faster than the first, the third faster than the second, and so on; each pair, of course, reducing the diameter of the pipe to be rolled. A large block or ingot of lead is cast on a rod of iron, and from this it is transferred to a rod or mandril, placed between the whole range of rollers; the first pair of rollers reduces the diameter of the ingot, and elongates it; the second still more; and so on, until the pipe is discharged at the other end, of the required size. The length of the pipe is only limited by the size of the ingot.

If I were to attempt an enumeration and notice of all the important improvements which have been made in the various branches of the manufacture of metals, this class, alone, would carry my report far beyond the limits allotted to all the classes; and I am therefore under the necessity of passing over to the next class, by simply remarking, that some of the most beautiful and important inventions are to be found among that class of machines which make up the workshop of the engine-builder and the machinist, and by which some of the most difficult operations are performed. The most conspicuous are *turning engines*, for small and large work, such as shafts, cylinders of steam-engines, chasing or cutting the threads of large screws, &c.; *planing engines*, by which surfaces of all kinds of metals are planished with a facility that would lead the uninitiated to suppose that, by some chemical process, the nature of the metal had been entirely changed; *punching* and *swaging machines*, by which articles of metal, before requiring days of hard labor, are formed at one blow; *boring* and *drilling machines*, &c., &c. It is with reluctance that I leave this branch so imperfectly noticed, as it would be matter of great interest and importance to show how much has been saved to the country, and to its industry, by the introduction of these various inventions, not only in the improved quality of the work, but in the reduction of prices; thus enabling the American manufacturer to compete with the powerful interests of British manufacturers.

2d. OF THE MANUFACTURE OF FIBROUS AND TEXTILE SUBSTANCES.

Of the preparation of cotton fibre.—Dr. Ure, in his work on the cotton manufacture of Great Britain, makes the following division of the operations, viz:

"1st. The *cleaning* and opening up or loosening the flocks of cotton wool, as imported in the bags, so as to separate at once the coarser and heavier impurities, as well as those of a lighter and finer kind.

"2d. The *carding*, which is intended to disentangle every tuft or knot, to remove every remaining impurity which might have eluded the previous operation, and finally to prepare for arranging the fibres in parallel lines, by laying the cotton first in a fleecy web, and then in a riband form.

"3d. The *doubling* and *drawing* out of the card ends or ribands, in order to complete the parallelism of the fibres, and to equalize their quality and texture.

"4th. The *roving operation*, whereby the drawings made in the preceding process are greatly attenuated, with no more twist than is indispensable to preserve the uniform continuity of the spongy cords; which twist either remains in them, or is taken out immediately after the attenuation.

"5th. The *fine roving and stretching* come next; the former operation being effected by the fine bobbin and fly-frame, the latter by the stretcher mule.

"6th. The spinning operation finishes the extension and twist of the yarn; and is done either in a continuous manner, by water twist and throstle, or discontinuously by the mule: in the former, the yarn is progressively drawn, twisted, and wound upon the bobbin; in the latter, it is drawn out and twisted in lengths of about 56 inches, which are then wound all at once upon the spindles.

"7th. The seventh operation is the *winding*, *doubling*, and *singeing* of the yarns to fit them for the muslin, the stocking, or the *bobbinet* lace manufacture.

"8th. The *packing press*, for making up the yarn into bundles for the market, concludes the series.

"9th. To the above may be added the operations of the dressing machines; and

"10th. The power looms."

In this classification the cotton-gin is omitted; and, although it is generally used by the planter, and may be considered an agricultural implement, nevertheless it is entitled to a notice in a general review of the cotton manufacture.

Since the invention of the saw gin for ginning cotton, by Eli Whitney, in the year 1793, this valuable invention has been greatly improved in the details, although in principle it is the same. The object of these improvements, which have been principally made within the last ten years, is to avoid as much as possible the tendency of the saws to cut the fibres, by so constructing the ribs between which the fibres are drawn, to separate them from the seeds, that they and the edges of the saw-teeth shall not act in the manner of shears; and at the same time avoid the tendency to choke the spaces between the ribs and break the seeds, either of which occurrences injures the staple of the cotton.

The saw gin is only applicable to the ginning of the short staple cottons, and for a long time after its introduction, and until the invention of the roller gin, the better qualities of cotton continued to be picked by hand. For many years the operation of the roller gin was very imperfect, arising from the difficulty of so constructing the rollers as to have them draw the fibres without breaking, and yet not adhere to the surface of the roller. These difficulties have all been removed by many

improvements which have been made, patented, and applied to use within a few years past. The rollers are now so constructed and arranged, that they draw and deliver the fibre without breaking it, and in some of the gins the pods are agitated and acted upon by a simple arrangement of machinery to loosen the seeds, and prevent the rollers from crushing them. These improvements must exercise a beneficial influence on the cultivation of the finer qualities of cotton.

Machines for performing the various operations in the manufacture of cotton enumerated above, have been the subject of patents in great numbers; and it can be said, without fear of contradiction, that since the organization of the factory system, invented by the justly celebrated Arkwright, the United States have done as much as any other nation to improve the machinery employed in every branch of cotton manufactures. A description of these various important improvements would be interesting, but it would occupy too much space, and could not be done, in many instances, without illustrative drawings.

It has always been deemed important to improve the water twist or throstle spinner, so as to render it capable of spinning those qualities of yarn spun on the mule; the former, by its continuous operation and greater simplicity, being much more economical. Every conceivable form and arrangement of flyer, spindle, and bobbin, was resorted to; but the main object has not yet been attained, although by these efforts the throstle spinner has been greatly improved. While these efforts to substitute the throstle for the mule spinner were being made, some of the most ingenious mechanicians of Europe and this country were exercising their ingenuity to render the mule a self acting, or power, instead of a hand-machine regulated by the skill of the spinner. After many years of fruitless efforts, the desirable object of substituting the automatic for the hand operation succeeded; and now, many of these machines—some invented in England, and some in the United States—are in successful operation in both countries. These machines, although successful, and exhibiting ingenuity of the first order in their inventors, are yet very complex; and therefore this branch continues to be of great interest to the inventor and manufacturer.

The looms will be spoken of under the general head of "weaving," and after treating of the preparation of all kinds of yarn.

Of the preparation of woollen fibres.—The preparation of woollen fibres by combing was for a long time a handicraft operation, attended with considerable difficulty; but, by degrees, it has yielded to the progress of inventions, and now it is performed by machinery. The machines for this purpose, invented by John Collier, of Paris, Cartwright, of England, and others, have, within a few years, been much improved and simplified, and their operations rendered so accurate as to separate with much more certainty the long and the fine, from the short and the coarse fibres.

The operations of carding, stretching, doubling, &c., as also the spinning, have been improved; and these improvements have pretty much kept pace with the corresponding operations on cotton. The length of the fibre, of course, has presented many difficulties, not encountered to so great an extent in the manufacture of cotton.

The spinning of the long woollen fibres in such a manner as to produce a smooth and even thread for worsted stuffs, without nap, has been attended with the greatest difficulty; but these operations are now performed by au-

tomatic machinery, with a degree of accuracy truly astonishing; and, indeed, so completely within the control of the mechanician have become all the operations to be performed on fibres, and the working of these into yarn, that they have at last succeeded in spinning threads of cotton covered with woollen, to make stuffs in imitation of woollen cloths—such as cassinets, which were formerly woven with cotton and woollen yarns mixed; the woollen threads being so arranged as to take the outer surface of the cloth, and conceal as much as possible the cotton threads.

The weaving of woollen stuffs will be spoken of under the general head of "weaving."

Of felting.—All animal fibres possess a quality, resulting from their peculiar structure, of uniting with each other, or rather interlocking, when submitted to friction in a moist state. This operation is called felting. It is in this manner that hats are made, whether of wool or fur. The wool or fur is submitted to the operation of carding, and is formed in a thin bat, which, in the manufacture of hats, is wound on a block; and after several layers have been wound on in different directions, so as to cross the fibres as much as possible. It is submitted to this operation of felting until the fibres are entirely interlocked, and a strong cloth is formed. It is then submitted to the various other operations necessary to the completion of a hat.

During the late war, when blankets were selling at a very exorbitant price, several attempts were made to manufacture them by felting, which did not prove profitable, although some blankets were made. Several years after, this process was again attempted in the State of Connecticut; and by persevering effort, and with improved machinery, the establishment struggled against adverse circumstances even unto success. This small and humble beginning has spread itself; and now establishments are in successful operation in some of the eastern States, and in Europe, for making carpets, rugs, and various other articles of great beauty and strength; and as figures and colors cannot be formed in the cloth by this process, they are stamped on afterwards. The durability of this kind of cloth having been questioned by those who always doubt when they can find no reason to condemn, the French Government put the matter to the test by clothing a company of soldiers in it; and at the end of one year the officer in command reported that the single suit of this kind of cloth was in a better condition than the second suit of spun and wove cloth given to the other soldiers. This difficulty of want of durability never would be made by one acquainted with the processes of making cloth either by spinning and weaving, or by felting; for both, at last, resolve themselves into felting. The spinning and weaving is resorted to, simply for the purpose of uniting the fibres preparatory to the process of fulling, which is another name for felting. The woven cloth is put into the fulling mill, and there submitted to great friction in suds, which greatly reduces the width of the cloth, and renders it thicker; the friction, &c., causing the fibres, previously united simply by spinning and weaving, to interlock and unite closer together. This is precisely the operation which takes place in the felting process; and experience has shown that the same amount of strength can be given with the one as with the other of these processes; although I believe that, for cloths requiring elasticity and pliability, the felting will not supersede the other and older method.

It is a matter of pride to know that this branch of manufactures, first introduced into this country, has also been introduced into Europe by Ameri-

can enterprise. Several patents have been granted, within a few years past, for machinery employed in this operation, highly creditable to the ingenuity of the inventors.

Of flax and hemp.—As the culture of these plants has become an important branch of industry in some portions of the United States, and many erroneous opinions as to the methods of treating the fibre have, to a great extent, gained credence, I may be justified in giving it a little more space than I would feel justified in devoting to the other branches.

It is generally believed that the processes of water or dew retting (a corruption of rotting) may be dispensed with to advantage; and hence many machines have been invented and patented, having in view the breaking of flax and hemp, and the separation of the fibre from the woody portion, without chemical means. This error has obtained in consequence of a want of due attention to the nature of the fibres, and their connexion with each other, and with the stock or woody part of the plant. The union of the "harl" (the term applied to designate the fibrous part from the woody part, or boon) is formed by a cementing substance soluble in water, and the fibres are united by gluten, which is insoluble in water. Long and well-tested experiments have been made to ascertain whether the harl could be separated from the boon, or woody part, by mechanical means, to avoid the time, labor, and attention necessary to conduct the rotting process, (which is known to be insalubrious,) as also to avoid the loss of weight occasioned by extracting the soluble part; but all these experiments have shown the uselessness of any such attempt. In the first place, the fibre sustains a greater injury by the mechanical than by the chemical process; many of the good fibres are entirely reduced to tow, producing a loss about equal to the loss by weight in the rotting process. In the second place, the fibres are much harder, rougher, and more difficult to work; and, what is of more importance, the fibre thus produced is not fit for any use. If intended for cloth, it cannot be spun; and if it could, the first washing would extract the soluble part; and if for ropes, the moisture to which they are exposed will bring about the very effects produced by the rotting process—with this difference: that, in the latter, the process can be arrested at the proper time—that is, when the soluble part has been dissolved; but when the rope is made of unrotted fibre, exposure to moisture will produce fermentation, that cannot be arrested, and which will in a very short time destroy the fibre.

These simple facts show, conclusively, the uselessness of any attempt to prepare flax or hemp without chemical means. Nature has formed the union by chemical agents; and therefore the proper mode of effecting the separation is by chemical re agents. And the intelligent searcher after improvements in this important branch of industry—important in an industrial as well as national point of view—will look to chemical, and not to mechanical science, for new developments. It presents a wide field for investigation and improvement. One tithe of the ingenuity which has been wasted on attempts to produce a machine that would effectually break and prepare flax and hemp without rotting, would long since have produced results important to humanity and industry, if applied rationally; but inventors are too prone to disregard the important developments of science which are every day bringing to light the hidden but simple secrets of nature.

The breaking is performed by a machine called a brake, which reduces the boon, or woody part, rendered brittle by the rotting process, so that it can

readily be separated from the harl, and at the same time partially separate the fibres from each other.

The machine for this purpose, generally used, consists of a bed formed of three or more slats of hard wood, placed edgewise at proper distances from each other, the space between being greater at one end than the other; and above this is placed the sword, which consists of a simple frame, jointed at one end to the bed, and provided with a slat of hard wood for, and corresponding with, each space between the slats forming the bed. This jointed frame, called the sword, is worked up and down, either by power or by the hand of the attendant, who, at the same time, places the stocks of flax or hemp on the bed, and gradually moves them along from the widest to the narrowest end of the bed.

This operation has also been performed by passing the stocks of flax or hemp between a set of fluted rollers. These two methods have, for many years, been practised; and many patents have been granted for various modifications and arrangements of them.

The broken stocks are then submitted to the next operation, called scutching, or swingling, to beat out the broken pieces of the boon or wood. The broken stocks are hung by the butts to a frame, and then struck a succession of rapid blows with a wooden blade, which passes along the whole length of the fibre from the butts to the points. The machines for this purpose have been variously arranged, by attaching the blade or blades to rotating or swinging arms, as also by various methods of holding the bunch or "strike" of flax or hemp.

The swingle or scutched harl is then submitted to the heckling or combing operation, by which all the remaining portions of wood are taken out, the fibres disconnected, and the tow, or short and imperfect fibres, separated from the long and perfect ones. This operation was formerly done by hand, the operative taking a bunch or strike of fibres, and drawing them repeatedly through a comb composed of several large wire teeth projecting from a block of wood. It has, however, given way to the machine heckling—the combs being arranged on a succession of cylinders, the combs on each cylinder being of different degrees of fineness, and the bunches of fibres fed in by fluted rollers. Or, the combs are attached in succession to a belt or chain which moves with greater velocity than the feed rollers; and in this way the fibres are separated from each other, and the tow removed. An important improvement was made on the cylinder machine, by giving to the series of cylinders different velocities—that is, the second was made to rotate faster than the first, the third faster than the second, and so on; by which means a sliver or riband of fibres can be made of any degree of fineness, each cylinder drawing out the sliver or riband finer than the preceding.

Various modifications of the heckling machines have been patented, and are now in successful operation; but it presented many difficulties; and there are very few branches of manufactures that for so long a time baffled the skill of the mechanician, as the preparation of these fibres.

Spinning flax and hemp.—The spinning of flax presented so many difficulties, that it is only within a few years that it has become an automatic operation, owing to the peculiar character of the fibres. Dr. Ure says: "If we compare flax with other spinning materials, such as wool and cotton, we shall find it to possess several characteristic properties. While cotton and wool are presented by nature in the form of insulated fibres—the former

requiring merely to be separated from its seeds, and the latter to be purified from dirt and grease before being delivered for the spinner—flax must have its filaments separated from each other by tedious and painful treatment. In reference to the spinning, and the subsequent operations, the following properties of flax are influential and important:

"1st. The considerable length of the fibres, which renders it difficult, on the one hand, to form a fine, even, regular thread; on the other, gives the yarn a considerably greater tenacity, so that it cannot be broken by pulling out the fibres from each other, but by tearing them across.

"2d. The smooth and slim structure of the filaments, which gives to linen its peculiar polished aspect and feel, so different from cotton, and especially from woollen stuffs, unless when disguised by dressing. The fibres of flax have no mutual entanglement whereby one can draw out another, as with wool; and they must, therefore, be made adhesive by moisture. This wetting of the fibres renders them more pliant and easy to twist together.

"3d. The small degree of elasticity by which the simple fibres can be stretched (only one twenty-fifth of their natural length) before they break, while sheep's wool will stretch from one-fourth to one-half before it gives way."

These peculiar characteristics, whilst they combine to render linen stronger than any other cloth, at the same time constitute the great difficulties in the way of constructing machinery to prepare and spin the filaments into yarn of good quality. The short fibres of flax "tow" can, and have for a long time been carded and spun in the same manner, and by the same machinery, as cotton and wool; as also the long fibres reduced to the length of cotton fibre by cutting; but the linen thus produced is, in fact, inferior to cotton, and, therefore, these methods have never been pursued, except by those who are disposed to defraud the public—a practice too frequently pursued by foreign manufacturers for their foreign purchasers, who are thus duped by mistaken economy.

The sagacity of Napoleon, when ruling the destinies of France, conceived manufactures to be the basis of the wealth and political power of Great Britain, and concluded that the most effectual way of breaking down this colossal power would be the introduction and improvement of every branch of manufactures on the continent, by the substitution of automatic for manual labor. With this view he stimulated, by royal bounties and high premiums, ingenious men of all nations; and, among others, a very high premium was offered to the successful inventor of machinery for preparing and spinning flax and hemp. The number of men that contended for the prize shows, conclusively, that ingenuity in all countries wants but encouragement. It is matter of regret that the fire of 1836, which destroyed the records of the Patent Office, has obliterated the history of the American inventions made to meet that prize, which was never awarded, as the test could not be made before the retirement to Elba. It has been my privilege in boyhood and early manhood to study the models of those beautiful specimens of American ingenuity, many of which yet live in my recollection.

After the fibres have been heckled and formed into a band of parallel rectilinear filaments, in the manner stated above, to form the foundation of the future band, they undergo a second operation, by which this band is drawn out into a sliver, or narrower range of filaments. The sliver then passes to the coarse spinning, by twisting the sliver into a coarse loose thread. This is done by a succession of heckle teeth and stretching rollers, and

twisting or condensing tube, or a flyer and spindle. The roving is then transferred to the operation of fine spinning—the machine for this purpose consisting of sets of drawing or stretching rollers to reduce the size of the coarse thread or roving, and the spindle flyer and bobbin.

In the spinning operation it has always been necessary to moisten the fibres, to soften and make them adhere, and produce an even, smooth thread; which has been done either by passing the roving through a vessel of water, or by causing a small stream of water to run on the stretching roller, or by having the under part of the roller pass through water. In the arrangement of the stretching or drawing rollers, each set rotates faster than the preceding, and the distance between each set must be a little greater than the length of each separate fibre; for it is evident that, if the individual fibre is held at the same time between the two sets moving with unequal velocities, of necessity it must break. For this purpose it had been the practice, in flax spinning-machines, to place the sets of stretching rollers at a distance apart, greater than the length of the fibres, as they are produced by the heckling machine. It has, however, been discovered that these fibres are only aggregations of many primary fibres, of about $1\frac{1}{2}$ inch in length, united by a gluten not soluble in the water during the rotting process; and that, by macerating the roving in hot water for several hours, and placing the sets of stretching rollers at the distance of about two inches, these short fibres are drawn out without breaking, and thus very fine threads can be spun.

The numerous machines patented in the United States and Europe, within the last ten years, are based on the general principles above explained.

Of rope making.—Hemp is only used for making ropes, and for making coarse cloths of great strength, such as sail cloth. When used for cloth, it is worked pretty much in the same manner as flax, and by the same kind of machinery; but, when used for rope-making, great care must be taken to lay in the fibres very regularly in spinning the yarn; and, indeed, this operation was considered so difficult, that until very lately it was entirely a handicraft operation; but it is now performed by machinery, with as much accuracy as by the hand of the best workman.

The forming of the strands, by twisting together the required number of yarns in such manner as to give to each yarn in the strand and in the rope an equal extension, was the subject of early and great attention, in consequence of its great importance in the commercial and naval marines; and inventions were made, and successfully applied to use, by means of which every yarn in the formation of a strand, and every strand in the laying of a rope, receives the same strain when the rope is completed. Without this care, it must be evident that by taking a number of yarns of the same length, and twisting them together, the outside ones are drawn very tight, while the inner ones are loose; and when submitted to tension, the outer ones must break, or be greatly stretched, before the inner ones are brought under tension. The yarns from separate bobbins pass through a perforated plate, with one hole for each yarn, so arranged that each yarn in the formation of the strand, as the whole of them are being twisted, takes its proper angle in proportion to the twist and the diameter of the strand; and as each yarn is under a properly regulated tension in passing from the bobbin, it is evident that in the strand each fibre will bear its proportion of the strain.

After the strands are formed, they are wound on to bobbins, and these

bobbins are placed in a machine to lay the rope. This machine consists of a main spindle, with a disk at one end, or three arms, in which work three small spindles, or rather flyers, parallel to the main spindle. Each of the flyers receives a bobbin with the strand. The three strands pass from the upper end of each flyer, and then through the nose of the main flyer, so formed as to give the required angle; and as the main spindle rotates to give the twist to the rope, each of the flyers is carried around with it, and rotates in the contrary direction on its axis, to give out the twist of the strands as fast as it is taken up by the twisting of the rope.

Machines have of late been invented, and are now in operation, for combining in one machine the two operations of forming the strand and laying the rope.

The operation of saturating the rope yarns or strands with tar, called "tarring," was for a long time performed entirely by hand, but is now in many places performed by machinery of a very simple nature.

It may not be inappropriate in this connexion to remark, that it has for some years back been proposed to substitute ropes made of iron wire for hempen ropes; but the great expense of twisting and laying wires by hand retarded the introduction of such ropes, which are only applicable where very little flexibility is required,—as, for instance, the standing rigging of ships, towing canal boats, drawing up trains of cars on inclined planes, and particularly in the mines of Europe, where the mineral is obtained at very great depths, and must be raised to the surface. The great difficulty attending the operations of laying and twisting the wires, so as to have each wire sustain its proportion of the tension without twisting each separate wire, and thereby destroying the greater part of its strength, retarded the introduction of such ropes. Patents have, however, been granted in the United States and Europe for making this kind of rope, which promise great success. In France and England wire ropes are now made with great facility, and at very moderate prices; so cheap, indeed, that hempen ropes are now scarcely used in the deep mines of Europe. The machine on which they are made is on the same general principle of the machines used in laying hempen ropes, described above. The introduction of this manufacture will not be very important in the United States, unless wire ropes should be introduced for the standing rigging of ships; which is being tested, the French Government having ordered a ship to be thus rigged, to put the matter to the test.

I find, by reference to the report of the canal commissioners of Pennsylvania, of December 30, 1843, that this subject has already attracted attention. The following is an extract from that report:

"The ropes for the inclined planes and ferries on the line of our improvements have hitherto been an enormous annual expense to the State. They are made of hemp, and, upon an average, it is believed that they do not last more than one season. There are ten required for the planes on the Allegheny Portage Railroad; one for the Schuylkill plane, one for the Millerstown ferry, and one for each of the slips for hauling out section boats at Columbia, Hollidaysburg and Johnstown. The average cost of each of these ropes is about $2,333, requiring an aggregate yearly expenditure of $35,000 merely for cordage to do the work upon the main line of our improvements.

"It has been an object with the canal commissioners to reduce this heavy expense, if at all practicable. For that purpose they ordered a wire rope

for plane No. 3 of the Allegheny Portage Railroad, last year, which was used a considerable portion of that season and the whole of the present year, and which seems to have been but little injured by use during that period. Wire ropes, also, but of a lighter size, have been procured for the slips for hauling out section boats at Johnstown, Hollidaysburg, and Columbia; one of which has been in use for two seasons, the other two have done the work for one season. A wire rope for plane No. 10 of the Portage Railroad has also been ordered, which has been manufactured and delivered at that plane, and which will be put on it in the spring.

"So far as these wire ropes have been tested, they bid fair to answer the purpose; and if the experiment shall ultimately prove successful, a large annual saving will be made to the Commonwealth by their substitution for hempen ropes."

I have compared a specimen of the wire ropes made near Pittsburg with some made in France, and find the former superior to the latter.

Of the manufacture of silk.—This branch of manufactures is yet in the germ, and so far, therefore, the machinery employed has been in imitation of the European methods, although several patents have been granted for machines to wind, double, and twist the filaments. As the worm performs that operation, which on cotton, wool, flax, and hemp, must be done by art, viz: spin the thread, there is less room for the ingenuity of man, than in the working of other textile substances.

Of weaving.—As the art of *weaving* and *knitting*, more than any other, presents difficulties, and requires the most complex varieties of motions to produce fabrics of every variety of color and figure, so it has produced the most admirable specimens of mechanical ingenuity.

In weaving, the threads cross each other at right angles; and therefore the principal difficulties are to be found in so arranging the various colored threads, during the operation, as to produce any required figure; but, in stocking and bobbinet work, the difficulties are of another and very complex nature. In these, the thread has in the progress of the work to pass through the loops previously made to form the web; and when there is a variety of figures, it is difficult to imagine any operation more intricate.

The power loom for plain and twilled stuffs, in its present condition, is the result of the labors of more than a century and a half—so difficult were the operations, that for a long time after the suggestions were made, none could be found bold enough to risk capital and time in an enterprise presenting so little chance of success; and, therefore, the *successful invention* of automatic weaving, which now surpasses the skill of handicraft weaving, is wholly the product of the 19th century. The difficulties to be overcome were not so much in separating the threads of the warp, to drive the shuttle through with the weft, and then to beat up the cloth; but to perform these operations on threads liable to break, by imitating the peculiar and elastic action of the hand in throwing the shuttle, and beating up the cloth. It was, in fact, boldly asserted, by men of experience, that the peculiar elasticity of the hand never could be given by machinery. After the accomplishment of this, the next task was to contrive the mechanical agents in such manner as to enable the automatic loom to work much faster than the hand loom, without breaking; for, unless these looms could be worked faster than the hand loom, there would be little or nothing gained. To accomplish this, the motions must be given very gradually; and the lay, by which the cloth is beaten up, must have an irregular motion, that when

thrown back, it must either pause, or move very slowly, to give time for the shuttle to pass through where the warp threads are sufficiently separated for its passage. By gradual improvements, year after year, these various objects were attained; and now power looms for plain fabrics throw the shuttle 150, and from that to 180 times per minute. The winding of the cloth on a roller, as fast as it is woven, and at the same time unwinding the warp yarn from the beam, and have these motions correspond with the inequalities of the threads of the weft, has presented one of the most formidable difficulties; and after many attempts in Europe and the United States, the most effectual plan which has been adopted is the invention of an American, who has succeeded in introducing it, with great credit to himself, in Europe and the manufacturing States of the Union. Many patents have also been granted for various methods of stopping the loom when either the shuttle does not pass entirely through the shed, or the weft threads break, which are important to the loom itself, and to the cloth woven. Several of these are in successful operation, as also instruments, called "temples," for keeping the cloth distended, width-wise, during the operation of weaving. These, together with the machine for preparing and dressing the warp yarns, and also for warping the yarn—that is, arranging the yarns which are to compose the warp on the warp rollers—are highly important, and have produced wonderful results in the manufacture of cloths of every kind and quality.

There is no branch of the mechanic arts in which apparently slight modifications have produced such important results as in the power loom. Some years since, when looms for simple fabrics made from 80 to 90 pecks per minute, they were believed to be perfect; and yet, by changes so slight that persons unacquainted with the peculiarities of the loom could not perceive them, they now make more than double the amount of work, with the same attendance; thus reducing the expense of weaving one-half. Although the common power loom is not, in a mechanical point of view, so interesting as those to which I shall refer hereafter; yet, as it supplies the necessary clothing to nearly the whole of civilized society, and has, by reducing the prices, clothed millions who were before naked, it is much more important than the others that minister to luxury and taste alone.

Prior to the present century, figured fabrics were woven on what is known as the *draw loom*, in which the threads of the warp intended to form the figure are drawn by a boy, under the direction of the workmen. The arrangement of the "mails," through which the warp threads pass to be drawn up for the passage of the shuttle, is very complex, and could not be described without drawings; but if the reader will only conceive that for every change in the form of the pattern, both as regards figure and color, there must be a complete set of these mails connected together, so that at one pull the warp threads are properly separated to permit the throw of the shuttle, and that the warp is often composed of more than 10,000 threads, and that many fabrics require a change of the figure for each throw of the shuttle, he will then be able to form some idea of the complexity of such an operation.

The *jacquard*, invented by M. Jacquard, of Lyons, in the year 1800, has entirely superseded the draw loom, or "draw boy," as it is called. By means of this apparatus, the whole operation is performed by the weaver himself. The changes of the threads in the figure are all stamped on a succession of cards connected together in a chain; there being one card for each change, and at each operation of the loom the card is shifted. There are skewers

of iron wire, to which the healds are suspended; and these are permitted to move, or remain permanent, by cross needles operated by the stamped cards. In this way the changing of the cards, simply, will change the figure. This simple piece of mechanism, compared with the complexity of the "draw boy," produces an important change in the manufacture of figured fabrics; but for a long time it was deemed important to connect the jacquard with the power loom; and the records of the patent offices of the United States, France, and England, for the last twenty years, show how important such an improvement was deemed by manufacturers. But, after many unsuccessful attempts, this object has been attained; and now, fabrics of silk, cotton, wool, and flax, of every variety and beauty of figure and color, are woven by the jacquard power loom. One of the most important applications of this mechanism is in the weaving of carpets and figured silks. Let the reflecting man watch this mass of inert matter in its evolutions, shifting the various colors to suit the pattern; remove one shuttle, and substitute others of different colored yarns; draw the yarn of the weft, after the throw of each shuttle, to make the selvage of equal tension; measure off the woven cloth with perfect accuracy, to make each figure of precisely the same length, (which has never been accomplished by hand;) and give out the warp in proportion to the size of the weft thread, which otherwise would make a difference in the length of the pattern; and see the whole mechanism stop at the breaking of a single thread, and he will scarcely be able to resist the reflection—Is this the production of mere man, or of creative power?

The fabric known by the name of *coach-lace*, such as is used for trimming coaches, is now woven with success by machinery invented and extensively used in the eastern States, as also knotted counterpanes. It is truly a matter of curiosity to see this latter piece of mechanism performing all the operations of weaving the web and forming the various figures by knotting the threads.

The machines now extensively used for braiding silk and other threads, and also strips of leather to cover whip handles and make the lashes, are very beautiful and ingenious specimens of American ingenuity. Stocking-frames for knitting stockings, and other articles formed in the same manner, have, until very lately, been hand-working machines; the machinery for this purpose, however, being a very beautiful piece of mechanism, and differing from the method of knitting with needles, which produces the same stitch, in making an entire range of stitches across the whole width of the piece at one operation; whilst, with the needles, but one stitch is formed at each operation. Many attempts have been made in Europe to work this machine by power, but without success. The expense of hand labor in the United States, however, stimulating ingenuity, has led to some important improvements in this branch; and there are now automatic stocking frames in successful operation, making stocking-net by the piece, which is afterwards cut into the required form, and sewed up into stockings; and other machines that knit the stocking of the required form, but by making only one stitch at a time. These two methods, although important and valuable, leave a wide field for improvement. In the hand stocking-frame, the workman stops at the required time, and, with an instrument, casts off or adds on new stitches, to narrow or widen the stocking where it is required; and, in the knitting machine mentioned above, the same operation is also performed by hand; and therefore, until this is all done by mechanism, it will be within the limits of handicraft, and not automatic operations.

As to the manufacture of lace, very little has been done in the United States, except in the way of consumption; but the operation is so beautiful and ingenious, that I cannot omit the following quotation, which will give some idea of the present condition of this branch of manufactures in Europe:

"The pillow-made, or bone lace, which formerly gave occupation to multitudes of women in their own houses, has, in the progress of mechanical invention, been nearly superseded by the bobbinet lace, manufactured at first by hand machines, as stockings are knit upon frames, but recently by the power of water or steam. This elegant texture possesses all the strength and regularity of the old Buckingham lace, and is far superior in these respects to the point-net and warp lace, which had preceded, and, in some measure, paved the way for it. Bobbinet may be said to surpass every other branch of human industry in the complex ingenuity of its machinery; one of Fisher's spotting-frames being as much beyond the most curious chronometer in multiplicity of mechanical device, as that is beyond a common roasting-jack."

Connected with the mechanism employed in preparing spinning and weaving various fibrous and textile substances, it is proper that I should call your attention to the fact, that the celebrated machine for making cards, used in carding cotton, wool, &c., with which, by a series of connected operations, the sheets of leather are punched, the wires cut to the proper length, bent, stuck into the leather, and then again bent to the required inclination—all done with so much accuracy, that, when the whole sheet is completed, all the points form a perfectly plain surface—has, since the death of the ingenious inventor, (Whittemore,) been simplified and improved; but there is no complex piece of mechanism, within the range of my knowledge, which was so near perfection, when given to the public, as this card-making machine, and which, in the same length of time, has undergone so few essential changes. I would also call your attention to another machine equally ingenious and meritorious—the machine for making weavers' reeds, first invented in the State of Rhode Island in the year 1816, introduced in this country and in Europe by the ingenious inventor, and from time to time improved by him, until it reached its present perfect condition. The reed of a loom is that part of the lathe, or lay, through which the warp threads pass, and by which they are kept apart, and the weft beat up after the shuttle has passed. Formerly, the thin plates of the reed were made of thin strips of reed, (hence the name "weavers' reeds;") but now they are generally made of thin strips of metal: these are bound and held together by two strips at the top and at the bottom, and bound together with waxed twine. This machine introduces and carries forward the strips for the top and bottom, introduces the strips that form the reed, cuts them off, winds around the binding threads in a manner to regulate the space between each strip, and waxes or cements the whole with wonderful rapidity.

Of fulling, napping, and dressing cloths.—These operations were formerly performed on woollen cloths by hand; but they are now all automatic. The fulling and napping were soon accomplished by machinery; but the operation of shearing was very difficult, and therefore required great ingenuity in the contrivance, and accuracy in the operation. One can form an approximate conception of this operation by examining the perfect finish of the surface of fine broadcloth. The cloth is first submitted to an operation by which the nap, or fibres of wool projecting

from the body of the cloth, is raised; it then passes, while under tension, between a permanent knife and rest, or roller, over which it moves towards the sharp edge of this knife, which catches the projecting fibres, that are then cut off by rotating or vibrating shears made very true, and accurately adjusted to the edge of the permanent knife. After this, it is passed to the dressing machine. The shearing machine was, for a long time, a very imperfect piece of mechanism; but, by degrees, improved workmanship in the construction of the mechanism, together with improvements in the contrivance, perfected it; and now it may be ranked among the most perfect of automatic operations.

Important improvements have lately been made to figure plain woven cloths by shearing. The roller, or rest, over which the cloth passes, is made in the form of diamonds, ribs, or other figures; and, as the cloth is stretched in passing over this roller, it sinks in the hollow parts, and therefore the shear cuts off the nap closer to the body of the cloth on the projections than in the indentations; and thus the figure is formed by the difference in the length of the nap.

Of the manufacture of hats.—Hats are either made of fur and wool, by felting, or of silk, without felting. The machine invented in Providence, Rhode Island, in the year 1825, for forming hat bodies, has produced a very important result in the manufacture of this article. By this machine, the bat of fur or wool (see the article, "*manufacture of wool*") is taken from the carding machine, and wound on a block in the form of two cones united by their bases, to which is given a compound motion—one of rotation about its axis, and the other vibratory—by which the bat is wound on the double cone and crossed, one layer being wound on in one direction, and the other the reverse; and so on, until the required thickness has been attained. After this, it is submitted to the usual processes of gumming and felting, and then cut in half, to make two hats, which are afterwards formed in the usual manner. Several machines have been invented and applied to use for felting, and working the fur into the body after it has been formed; and, in fact, for performing nearly every operation on hats, from the preparing of the fur, or fibre, to the pressing and ironing, most of which have been extensively used in the United States. The introduction of these labor-saving machines has so much reduced the price of hats in the United States, that any one who would undertake the importation of this article from abroad would pay heavily for his temerity.

In preparing and laying the fur on the hat body, it is important to have all the points of each separate hair in the same direction, so that when the hat is completed, the fur shall have the same relation to the body of the hat, that it has to the skin of the animal before it is cut off. This has been accomplished by very ingenious means. It was first ascertained that fur, subjected to a strong current of air, will be carried with the points in the same direction; and therefore the fur is discharged from a carding or combing cylinder into a chamber, where it meets with a powerful current of air, which carries and deposites it on a bed prepared to receive it, with every hair as perfectly arranged as by nature on the skin of the animal. Various modifications of this principle have been patented, and are now in use.

Of the manufacture of paper.—This branch of industry has also been the subject of many and important inventions; and has been carried so far, that every important operation has been changed from the handicraft to the

automatic. The rags are washed, and, by a series of automatic operations, completely torn and reduced to a condition for making pulp, which is also done by machinery. Formerly, the sheets of paper were entirely made by hand; but, in the commencement of this century, paper-makers in France, England, and the United States, (although scarcely in a condition at that time to think of manufactures,) turned their attention to the formation of the sheet by power machinery. This object was first sought after to make long sheets for paper-hangings, which could not be done by hand, and which, therefore, required to be made of many pieces pasted together. These various efforts, running through a succession of many years, were at last accomplished by a machine, which consists of a hollow cylinder perforated with small holes, or formed of bars covered with wire gauze, and placed against the discharging spout of the vat containing the pulp, which from thence is discharged on to the surface of this cylinder exhausted of air, that the pressure of the atmosphere may compress the fibres of the pulp on, and force the liquid through. From this cylinder, the sheet of paper thus formed is carried off to pressing, sizing, and drying rollers, and from thence to the cutting machine, by which the continuous sheet is cut into the required size. It is only of late years that the latter operations have been added to, and made continuous with, the formation of the sheet. This machine, at first only intended and used for paper hangings, is now used for all kinds of paper. So perfect is the operation of the mechanism, that paper made of inferior fibre, such as cotton, can only be detected from the best qualities of linen paper, by experienced judges.

3d. STEAM AND GAS ENGINES, INCLUDING BOILERS AND GENERATORS, AND FURNACES THEREFOR.

In casting the mind's eye over the whole catalogue of human inventions, we find one conspicuous above all others for the benefits it has conferred on society—in relieving the crushed and oppressed laborer from his toils, that he may have time to improve his mind and condition—in clothing the naked, feeding the hungry, and spreading the blessings of industry and civilization in every part of the world. This is the steam-engine, indicated and imperfectly essayed by many, but first systematized, improved, and successfully applied, by the master mind of James Watt. What it was in principle when given to the world by him, it is now; although the moving parts have been simplified and perfected, and arranged to suit its application to the various branches of industry to which it has given rise, or which it has greatly enlarged.

The great progress made in the steam-engine since Watt's time is more due to the increased knowledge of its properties, and better understanding of the general rules that should govern mechanical structures, and the improvement of all the mechanic arts, particularly in the working of iron, than to the improvements in the engine itself; although these are, by no means, insignificant. They do not, however, individually stand out so boldly as to require a special notice in so hasty a sketch as this. They have generally been confined to the methods of making and packing the pistons, the construction and management of the valves, the condenser, the air-pump, and the connecting parts.

In looking over the list of patents granted in the United States and Europe for modifications of the steam-engine, one would be led to believe that they have produced wonderful changes. But this would be an error;

for by far the greater part of these supposed improvements, thus patented, have been invented in consequence of a want of accurate information on the part of the projectors, who have blindly followed a phantom. Some of the early writers on this piece of mechanism disseminated errors in treating of the principles of the engine, which are but slowly giving way to truth, and which have induced the greater part of these worthless patents. The leading error was the supposed loss of power in the use of the crank to change into a rotary the rectilinear motion of the piston necessary to the transmission of motion and power. This gave rise to that endless variety of contrivances known under the title of "substitutes for the crank," which is admitted by men of science and experience to be the most perfect piece of mechanism that can be conceived in its adaptation to the reciprocating engine. It transmits all the power applied to it, less the friction, and is the very perfection of simplicity; and yet we find, from the promulgation of this error, an endless variety of complex and fragile contrivances patented to dispense with the crank. The other error was in teaching that the force required to overcome the inertia of the moving parts is lost; while it has been demonstrated by science, and proved by experience, to be a mere transfer of this force from one half of the action to the other. The promulgation of these two errors has occasioned the waste of a vast amount of ingenuity, as it has given rise to nearly all the rotary steam-engines—a large class of inventions, which, in the opinion of scientific and experienced engineers and machinists, never can supersede the reciprocating.

The introduction of the simple high-pressure engine, so extensively employed, is principally due to the genius and enterprise of Oliver Evans. For certain locations it is indispensable; and its simplicity adapts it so well to operations requiring small power, that the idea of using condensing engines for small power is scarcely ever entertained.

After steam was successfully applied to navigation, it underwent many important changes in the arrangement of the parts, and particularly since steam-vessels have been constructed for long voyages at sea; but these changes are principally in what may be termed the architecture of the steam-engine, and therefore not generally coming under the head of inventions, although patents have been granted for some of these arrangements. The great objects have been to condense the engine within the least possible compass, and, at the same time, retain sufficient length of stroke and connecting-rod, and so dispose the framing as to do the least injury to the ship's frame by straining. These ends have only been attained by the exercise of much judgment and skill.

As the saving of room in a steam-ship for long voyages is of the first importance, it was, at an early period, suggested to compose the boiler of a series of small tubes, similar to locomotive-boilers, thus to obtain the required amount of fire surface within a small space. But experience soon showed that the deposites of marine salts by evaporation were too great for boilers consisting of small tubes; and that even in boilers of sufficient capacity to admit a man in every part, these deposites were very injurious. This led to various suggestions for preventing either the use of sea-water, or, when sea-water is used, to prevent it from becoming a concentrated solution.

The method adopted to avoid the use of sea-water consists of a tubular condenser, immersed in a current of cold water, conducted from

without the ship, and thus kept cold; the inside of these tubes being in connexion with the cylinder of the engine and the air-pump; the surface of cold metal is used for condensing the steam, instead of a jet of cold water. By this arrangement, the water produced by the condensation of steam is pumped back into the boiler; and all that is necessary is, to have a small distilling apparatus attached, to distil the water necessary to make up for the waste steam. The objection to this plan is the additional complexity, and the fact that condensation by metallic surface is not so rapid as by a jet of cold water.

The other method is, to draw out a portion of the concentrated water, and to replace it with cold water, and saving as much of the heat as possible, by inserting the induction-pipe through the eduction, so as to heat the cold water by the hot water drawn out. This, of course, occasions a loss of heat.

The application of steam to railroads opened another field of ingenuity and skill. Here the high-pressure engine alone is applicable, from its simplicity and small weight, compared with condensing engines. The number of strokes made by the engines of a locomotive would have been pronounced an impossibility, and therefore slow-working engines were used, with cogged-wheels, forming the connexion to give to the wheels the necessary velocity; but these were soon found to be useless, cumbersome, and liable to get out of order, and are now only used under peculiar circumstances. The ingenuity which has been exercised in forming the connexions between the engine and the crank—the former being on the carriage, and the latter on the axle of the wheels, or directly on the wheels; the carriage and the wheels being connected by springs, to admit of independent motions—is deserving of especial commendation. Much has also been accomplished in locomotive steam-engines by the arrangement of the valves, and the parts that work them. But the leading improvements in locomotives have been in the various arrangements of the driving-wheels to obtain sufficient traction to ascend inclined planes of considerable inclination; and it is matter of pride that, in this and other particulars, the locomotives constructed in the United States are not only superior to the English locomotives for many purposes in our own estimation, but in the estimation of European companies and Governments; who have evinced this, by the purchase of large numbers of them. Any one who will look at the plans of the first locomotive imported from England, and on those now constructed, will scarcely believe that it has, in so short a space of time, undergone such important changes.

There is a large class of inventions having some connexion with the steam-engine, which it is important to notice at this time. These are engines to be worked by the expansive force of atmospheric air, and other gases, as substitutes for steam. It is truly to be regretted that inventors do not more frequently pursue the inductive system, and make themselves acquainted with first principles, before building up theories. Such is the tendency to theorize in some minds, that we have seen learned men actually forgetting the alphabet of their scientific education, to follow out this phantom of a gas-engine. One proposes to expand atmospheric air by the direct application of heat to a vessel containing it, and then to apply its expansive force to a piston. Another proposes the application of the explosive force of gun or percussion powder. Another, for locomotive purposes, proposes to condense air into a vessel by means of a steam-

engine, which vessel is afterwards to be transferred to a locomotive, the air then to be expanded by the application of heat. Another proposes the application of carbonic acid gas, and so on through the whole catalogue of gases, with an endless variety of devices for accomplishing these ends; exhibiting an amount of ingenuity which, if properly directed, would have produced important and beneficial results. One single inquiry settles the whole question of usefulness. How much expansion will be produced by a given amount of caloric applied to these gases and to water? We know, by actual experiment, that atmospheric air and all other gases are doubled in bulk by 445 degrees, and that 1,000 degrees applied to water will increase its bulk 1,728 times; and yet, in view of so plain a question as this, we find men—and men of merit too—wasting time, money, and ingenuity on this fallacy. Professors and lecturers on mechanical science should take every opportunity to expose these fallacies.

Of steam-boilers and generators.—The smaller a boiler is made, in proportion to the quantity of steam to be generated in a given time, the less force is contained in it, and therefore the less thickness of metal is required to resist that force, and the less bulky and cumbersome it is. These well-established facts soon led to various propositions for reducing the bulk of the boiler, whilst the same amount of surface should be exposed to the action of the fire, by various arrangements of flues, through which the heat is conducted before it escapes to the chimney.

Our countryman, Oliver Evans, who may well be called the father of high-pressure engines, seeing the necessity for more strength in the generators or boilers for high-pressure engines, than could be safely obtained in the boilers used for low-pressure, introduced the cylindrical boiler, generally used on the western waters; and, when steam came to be applied on railroads, reducing the size of the boiler became of indispensable necessity: this led to the invention of the boilers now used on locomotive steam-engines, which are composed of a series of small tubes, through which the flame and heated gases from the furnace pass on their way to the chimney, and surrounded with water. By this arrangement, a large amount of fire-surface can be obtained within a very small compass.

Many patents have been granted for various arrangements of generators, composed of series of tubes, to contain the water, and to be heated from outside. These, however, have heretofore presented many difficulties—such, for instance, as keeping the required quantity of water in a vessel of small capacity, and, evaporating with great rapidity, preventing the water from passing into the cylinder; and, for locomotive purposes, keeping the whole sufficiently level, to prevent one portion of the series from being dry, whilst the other has too much water. Improvements have been lately made with the view to obviate these difficulties; but whether or not they will prove successful, is a question for experience to answer.

The numerous accidents by the explosion of boilers, shocking to humanity, which have occurred in every part of the world in which this dangerous but useful agent is employed, have stimulated ingenuity to contrive some method of control and safety, either by acting as an indication to the engineer, or by relieving the boiler of the dangerous pressure. The investigations of men of science into the properties of steam, and the action of heat on metal when under pressure, have opened the field for inventors, who, of late, have in this country been still further stimu-

lated by the appointment of a commission, under an appropriation of Congress, to test all improvements having in view the safety of steam-boilers. Many patents have, of late, been granted for devices prepared for this test; and, as the report of this commission will be submitted to Congress at this session, with a description of the various devices tested, it is deemed advisable to withhold any further remarks on this subject at present. It may be well for me to add, that no apparatus of safety can ever dispense with the services of an intelligent, skillful, and prudent engineer, thoroughly versed in the theory and practice of the steam-engine, the properties of steam, and the metals of which boilers are constructed, and the nature of combustion. It is to be regretted that these qualifications have been so much neglected; and I am happy to inform you that the engineers in the different States are organizing societies, and are about to submit a plan to Congress for the better regulation of steam navigation.

Much has been done to improve the furnaces of steam-boilers, and to regulate combustion in them, with the view of saving fuel; but, until a few years back, those engaged in these pursuits have unfortunately neglected the developments and researches of chemical science; and, as the chemical affinities and changes going on in the furnace are not visible to the naked eye, improvements were more the result of accident than induction. However, of late, engineers have seen the necessity of studying that part of chemical science having relation to these subjects; and the happy results begin to be visible in the invention of means to regulate the introduction of atmospheric air to the furnace, that all the combustible materials may be consumed before they escape from the chimney.

For a long time after the introduction of steam in the United States, the low price of wood rendered economy in fuel of minor consideration; and hence very few attempts were made at improvements in this branch. But in Europe, scarcity of fuel was always an inducement to the inventor; and hence we there find many more efforts than here, but directed with no more judgment and knowledge. Economy of fuel, and avoiding the nuisance of smoke, were the great inducements to improvement; and hence the innumerable schemes for burning smoke, by causing the smoke of one fire to pass over another. This was the theme of many patents here, as well as abroad—a theme which, unfortunately, has not yet been exhausted. A method manifesting more ignorance of the laws of combustion could not be conceived. Smoke is the product of imperfect combustion, there not being sufficient air supplied to furnish the amount of oxygen necessary: how, then, can this smoke be consumed by a second fire, which also carries on an imperfect combustion for the want of sufficient oxygen? This simple question shows the fallacy of any such attempt.

It has been proposed to render the combustion in furnaces complete, by introducing a current of air above the incandescent coals on the grate, with the view of supplying the necessary oxygen to the combustible gases as they are evolved from the coals; but, in practice, this was found to produce more injury than good, by cooling the bottom of the boiler. Since this, it has been proposed to introduce a blast of air beyond the bridge of the furnace, there to meet the escaping gases, and produce their combustion in the flues of the boiler, and thus prevent smoke, and save all the combustible gases. This method has been essayed in England, and the reports are various and contradictory, from the fact that it has not been put to the test of experiment, under the direction of disinterested, compe-

tent men, who would, by a series of essays, ascertain whether the amount of additional heat given out by the combustion of the combustible gases, contained in the products of combustion passing out, is sufficient to elevate the temperature of the air thus introducèd, to the temperature of the products of combustion without the air. If more than enough of this heat is saved by the method, it would then simply remain to consider whether the amount of heat saved, and the prevention of smoke, are sufficient to compensate for the additional labor, expense, and inconvenience consequent upon its introduction. Unfortunately, these new plans, affecting general interests, are suffered too long to rest on the judgment and statements of interested persons.

A modification of the last-mentioned method has lately been patented, which consists in introducing a blast of heated air under pressure, instead of the cold air or heated air without pressure. I have not heard the result of the essays, which, I believe, are in progress.

This subject presents a vast field of inquiry for the man of science and the inventor.

The invention of rotary fan-blowers, to excite combustion in furnaces, has been one of the most important inventions; but as it was invented before it was wanted, the inventor has derived no benefit from his patent; and now that it has become public property, it is generally used.

4th OF NAVIGATION AND MARINE IMPLEMENTS.

Naval architecture, like every other branch of mechanical science, is on the march of improvement; but the construction of ships depends more upon the progress of science, and inventions in the collateral arts, than in new methods of building ships. When I come to the class of lumber, and methods of working it, I shall have occasion to refer to various machines, which have an important bearing on ship-building.

The introduction of iron as a substitute for wood in naval constructions, is destined to produce an entire revolution in this branch of the arts. Inventions are now in progress, and several have already been patented, for methods of forming, shaping, and uniting the plates of sheet iron in constructing boats and vessels The dangers of a sea voyage tend to retard the introduction of untested methods of constructing ships. At the first suggestion, the objections advanced by ignorance, timidity, and self-interest, are magnified; and hence we see that all important changes in navigation have been introduced by slow and gradual steps—first in small boats, then in larger, then vessels of small class for short voyages, until, by degrees, all apprehehension is removed, and it is matter of astonishment to all that any such fear ever existed. The use of iron for ship-building has undergone this ordeal, and now we find that it is being introduced very generally. When first suggested, it was objected that a vessel constructed of this material could not have the required elasticity, and, therefore, would be more subject to break than when constructed of wood; when the fact was well known, that any structure of iron, of equal strength with one of wood, was less liable to break from a sudden shock than the wooden one. Experience, however, has now established the superiority of the iron in this particular. As to the question of durability, it is one much more difficult to decide than the one of strength; and on this head I beg to refer you to the following extracts from a work enti-

tled "The Civil Engineer and Architect's Journal," for November, 1843, viz:

"Hot or cold blast produces very little difference in corrodability of cast iron, and this results chiefly from difference in density; recollecting that carbon exists in cast iron in two very different states, viz: as diffused graphite in a crystalized form, and as combined carbon; that the dark gray and softer irons contain more of the former, while the harder and brighter irons have more of the latter; that the latter kind have much less uniformity of surface, when cast under similar conditions, than the former; while the highly graphitic irons, though more uniform in large specimens, are the least dense and softest in texture. We arrive hence at the ultimate choice, that the bright gray irons of high commercial value, while they are in all other respects the most useful for construction, are also the most durable when exposed to the action of air and water. The second prolonged period of immersion of all the specimens was necessary, in order to determine the 'law of progression of corrosion, with respect to time.' The author finds that, where the coat of oxide and of carbonaceous matter, or plumbago formed, is constantly removed from the surface of cast iron, exposed to corrosion in air and water, the progression of the latter is a decreasing one; because, as the metal is removed, the inner portions become more uniform in texture, and fewer minute voltaic couples are formed; but, where the oxides and plumbago remain untouched—these being both electro-negative to the metal—nearly equilibriate the effect of the regular texture; and thus the weight of corrosion remains uniform, or is nearly in direct proportion to the time of re action. This is demonstrated experimentally, and is most forcibly exhibited in corrosion by sea water. Hence, in practice, cast iron immersed without any protection, will corrode less if occasionally scraped and cleaned, or if in a tide-way, than if untouched and in still sea water.

"The rate of corrosion, as dependent on the metal itself, is a minimum when the cast iron is most uniform and hard, and free from suspended graphite, and as dependent upon the water in which it is immersed; is a maximum in foul sea water, and a minimum in clear river water, both being at mean temperature, and containing nearly the same volumes of combined air and carbonic acid. The kyanized oak boxes, 2 inches in thickness, in which the specimens were immersed in Kingston harbor, were eaten through in about two years, by the *limnoria terebrans*. Cast iron, freely exposed to the weather at Dublin, and to all its atmospheric precipitations, was corroded nearly as fast as if in clear sea water, when the specimens in both cases were wholly unprotected.

"The results of experiments on wrought iron and steel show that they consist of two or more different chemical compounds, coherent and interlaced, of which one is electro negative to the other. The electro-positive body being that which suffers first from corrosion; the electro-negative portions of the iron and steel remain bright, and hold a perfect metallic lustre until the whole of the other portions are removed—or at least are so, to a great depth—when they begin likewise to oxidate. In general, the finer the quality of wrought iron, and the more perfectly uniform its texture, the slower and more uniform is its corrosion in water; minute differences in chemical constitution produce little change in this respect. Highly silicious wrought iron, however, corrodes very locally, and appears to be partially defended by a thin coat of silex formed on it. Fagoted

scrap bars, made from best Staffordshire rivet-iron, was found, of all the irons experimented upon, to be the most durable; next to this, was Low Moor boiler-plate, and it is thence preferable for iron ship-building. Foul sea water, evolving sulphuretted hydrogen, gives the maximum corrosion of wrought iron and steel. The contact of soft putrifying mud appears to be still more destructive. Steel generally corrodes more uniformly and slowly than wrought iron. Hardened cast steel, after "tilting," has the average minimum corrosion; and low shear-steel, which is, in fact, a sort of steely iron, has the maximum.

"The author then discusses the conditions most and least favorable to corrosion in marine steam-boilers, with reference to the degree of saline concentration, boiling temperature, &c., of the sea water; and gives tables of the saline contents at various stages of concentration. Sea water, to act least on boilers, should be heated to 190° Fahrenheit, and be deprived of air before entering as feed-water; and the less concentration takes place, the less will be the amount of corrosion. The tables of the amounts of corrosion of cast iron, in contact with definite alloys of copper with tin and zinc, are now extended to wrought iron. The corrosion of this is accelerated by the contact of either brass or gun-metal in sea water, but more so by the latter than by copper. He confirms his previous results, that, except in atmospheric air, a coating of zinc, or contact of zinc in a massive form, affords to cast or wrought iron only partial protection from corrosion.

"In foul sea water the zincing is converted into artificial blende = (Zn. + Fe. + S.) Elkington & Ruolz's zincing process he finds capable of many useful applications for iron exposed to air, but he questions its efficacy in water, or where there is abrasion. Zinc paint he states to have been found the most durable of all the paints and varnishes tried, except coal-tar laid on hot, and the asphaltic varnishes.

"The author then enters largely into many questions relative to the corrosion and fouling of iron ships, applying to them the laws he had previously deduced. Based on the known effects of a slightly alkaline solution in preventing corrosion, he proposes lime-water to replace bilge-water, and thus to prevent internal corrosion in iron ships. He describes his prolonged experiments on the means of preventing their external corrosion and fouling, and the details of his methods of preventing both. These consist in coating the plates with an alloy of zinc with mercury, and a very minute portion of the base of either of the alkalies. The coating is effected by peculiar methods to insure perfect uniformity; and the principle of protection is, that the alloy produces, by the first action of a menstruum, a surface of amalgamated zinc which is insoluble. This coating is protected by an asphaltic varnish, to prevent the contact of the slightly soluble poisonous paint, with which the ship's hull is payed over to prevent fouling. Several metallic salts are fitted to act as poisons to the molluscous and testaceous animals which infest ships' bottoms; but the author's experience leads him to prefer oxychloride of copper, which is, in fact, the salt formed on common copper sheathing, and which, by its poisonous qualities, keeps it clean.

"The author's method has been in use for some time on vessels which have made voyages to the tropics, and its usefulness in preventing fouling, &c., has been fully proved. He discusses and explains the errors which have been made as to the non-corrosion of ships kept in motion,

and shows that corrosion does take place, but that it is not so perceptible as when the ship remains at rest. He shows that magnetism has nothing whatever to do with the amount of corrosion in iron vessels; and also discusses at length various contingent circumstances promoting partial corrosion in iron ships—the nature of cargo, the mode of fastening the machinery, the contact of boilers, of various timbers, and of the same when decayed, &c.; all of which are of practical importance to the iron ship-builder, or marine engineer. Kyanized timber is rapidly destructive of iron in contact with it; in sea water it more than doubles the rate of its corrosion. After giving a table, containing the numerical values for iron ship-building, of a number of qualities of British wrought iron, the author proceeds to discuss in detail the principal methods of protection for iron which have been recently promulgated by Berry, Neilson, and others; all of which are patented, but none of them, except that of Elkington & Ruolz, are, he contends, proved to be of practical value in the conditions above mentioned.

"Lastly, he states that, as uniform corrosion cannot be insured in the case of iron ships, and as local action is liable to produce fatal accidents at unlooked-for moments, protection from corrosion and fouling must be considered essential to the safety of iron ships; if so protected, the author contends that they are safer in every respect than the best vessels constructed of timber. He also gives instances, from various authorities, of the rapidity with which foulness accumulates on ships' bottoms, even of wood, and more so if of iron; and dissents as to the possibility of removing the fouling of iron ships by any scraping process, unless performed in the dry dock, and constantly repeated.

"The communication concludes with some observations as to the presumed differences in the rate of corrosion between railway bars in use and out of use, or traversed in one or in both directions. Upon this subject the author has several experiments in progress on several railways, and expects, at a future time, to lay the results, as to the amounts of loss by corrosion and abrasion, before the institution; at present, his belief is that railway bars, being otherwise in the same condition, corrode alike whether travelled over or not.

"Mr. Williams agreed in the advantage of preventing the corrosion of iron vessels, but he feared the expense of the mode proposed by Mr. Mallet; particularly as, at present, although comparatively unprotected, they were very durable. He instanced particularly the light boats on the river Shannon, which, although constructed of very thin iron, and had been at work between six and seven years, exhibited no signs of decay.

"Mr. Rendel said that the durability of iron canal-boats was well known. On the Tavistock canal there now existed some boats which had been employed for twenty five years in carrying coals, iron, and copper ores, or other goods, and yet they were not extensively corroded.

"Mr. Field stated that, although in India iron generally corroded rapidly, the iron vessels that had been sent there did not appear to be affected sooner than in England. He had been informed by Mr. Laird that the boilers of the *Garry Owen*, iron steamer, had been renewed twice in nine years; and on every occasion it had been remarked, that, although the bottoms of the boilers were entirely destroyed, the iron plates of the hull of the vessel immediately beneath them retained their original coat of paint, and were not at all corroded.

"Mr. Jordan suggested the probability of the hull of the vessel being protected at the expense of the boilers, on account of the electric character of the metal being altered by the heat of the boiler, and the general circumstances induced.

"Mr. Field said that the boilers in question had lasted as long as they would have done on board a timber-built vessel.

"Mr. Williams corroborated the statement. The boilers had worn out in the regular time, and had failed first in the usual spot, which was the bent plate, where the sides joined the bottom. There was not anything remarkable in the wear of the boilers.

"Dr. Ure thought that the heat of the boilers, having probably been sufficient to dry up any moisture from beneath them, might have tended to preserve the hull of the vessel from corrosion in that spot. It was easy to account for a less degree of corrosion taking place in iron ships, or on rails of railways, as long as the former were constantly kept moving, and the latter were regularly travelled over. In these cases, any oxidation which took place was rubbed off as it was formed; but if either were in a state of inactivity, the scale of rust permitted an accumulation of moisture beneath it, an active galvanic pile was completed, and oxidation went on with increased rapidity.

"Mr. Vignoles remarked that the paper did not notice the iron water-tight bulk-heads for vessels, which had been introduced by Mr. C. W. Williams. Their practical utility was now generally admitted, and he believed they were about to be adopted in the navy.

"Mr. Williams said, that about nine years since he first introduced the system of dividing the hull into five compartments, by four water-tight iron bulk-heads, with the intention of their adding to the strength of wooden vessels; but it occurred to him that they would be otherwise useful, and although the ship-builders opposed it, he persevered, and now all the vessels under his superintendence had them. Their value had been proved on many occasions, and by them the *Royal William* and several other vessels had been saved. With four bulk-heads it was impossible for a vessel to sink, unless three of the compartments were broken into, which was scarcely possible.

"The president believed that the *James Watt*, which was built at least sixteen years since, had three close timber bulk-heads, intended for the same purpose as the iron ones.

"Mr. Williams replied that they would not answer the same purpose as the iron ones; and that if a vessel had only three bulk-heads, making four compartments, if one of them was broken into, the vessel would sink; but, with five compartments, it would be saved. With regard to the general durability of iron vessels, he recollected an iron vessel being built at the Horseley iron-works, more than twenty years since, which, he believed, was still in existence; and a small boat, built for him by Mr. Grantham, of very thin plates, in the year 1824, was still at work.

"The secretary stated that the vessel alluded to by Mr. Williams was the *Aaron Manby*, which was built by, and named after his father, in the year 1821. It was the first iron vessel that ever went to sea. It had been very roughly used, and the engines and boilers had been more than once renewed; yet the hull had scarcely required any repairs, and it was very slightly corroded, although it had been severely tried, by being used in both fresh and salt water upon the river Seine, for which service it was

built.* It was well known in Staffordshire that many iron canal-boats which were used indiscriminately for carrying coals, iron ore, limestone, and other cargoes, and had received scarcely ordinary attention, were upwards of forty years old, and were still serviceable."†

The evidences here given of durability must be conclusive.

By the use of iron in ship-building, will be avoided that most frightful of all sources of danger at sea—fire; particularly dangerous in steam-ships. The introduction of bulk-heads, by which to divide a ship into several separate compartments as a means of safety, is a device of the first importance, which is being very extensively introduced, and, I believe, never omitted in ocean steamers.

Since the successful application of steam to the propulsion of boats and other vessels by Robert Fulton, many attempts have been made to improve his method, by substituting for the side paddle-wheels some other mechanical agent. Some of these were known and had been made the subjects of patents before Fulton's time; but most of them since, and some very recently.

The method proposed by Rumsey, of Virginia, was to propel the vessel by jets of water drawn in at the bow, and forced out at the stern, through horizontal pipes ranged along the hold of the vessel; the water to be drawn in and forced out by pumps actuated by a steam-engine. This method has been the subject of many patents granted for various modifications of it, some of which have been obtained very lately.

The following is an enumeration of the general principle on which propellers have been suggested or constructed, viz:

Reciprocating paddles arranged at the stern, sides, or bottom of the vessel, and so constructed as to fold up or feather in the returning action. This, like the preceding, has been the subject of many patents, and there are many who are still pursuing it.

Spiral paddles arranged on a shaft, placed parallel with the keel of the vessel, the paddles acting on the water diagonally. This has been the subject of more modifications than any other. It was suggested at a very early period of steam navigation, and tested under various circumstances. It has been forced forward against every species of opposition, and, at last, it is applied to some vessels of large class; but as its success is still, in the minds of some, an unsettled question, an expression of opinion is, of course, not appropriate here.

Attaching paddles to an endless chain or band passing around two or more drums, with many paddles acting on the water at the same time, and in succession; making the buoyant part of the vessel to consist of a series of hollow drums, having paddles parallel with their shafts, and a platform above, resting on the journals of the drums or cylinders, with the view of having these drums or cylinders roll over the surface of the water, as the wheels of a carriage. This has been modified by making the com-

* "Iron as a Material for Ship Building," by J. Grantham, 8vo.: London, 1842, p. 6.

† In a letter from Mr. John Laird, dated June 29, 1843, he says, respecting the probability of corrosion in iron vessels: "I beg to state that the following vessels have had their boilers replaced, (some of them twice,) and that the bottom and sides of the vessels near the boilers have been found quite free from corrosion; in fact, the paint originally put on was almost perfect: Lady Lansdowne, built in 1833; Garry Owen, built in 1834; Eliza Price, built in 1836; Duncannon, built in 1836; Duchess of Lancaster, built in 1839.

"The *Euphrates* steamer, built in 1834, has had her machinery taken out, and been converted into an accommodation boat for passengers for the Indus. The hull of the vessel was found quite perfect, free from corrosion, and as perfect and sound as the day she was launched."—*Sec. Inst. C. E.*

mon paddle-wheel to consist of a hollow drum, with paddles projecting, for the double purpose of propelling and assisting to buoy the boat, and arranged on each side in the manner of paddle-wheels. And again, in having the axis of the drums parallel with the length of the vessel, and in the form of a double cone with spiral paddles.

Vibrating paddles have been variously arranged at the stern, bow, sides, and bottom of vessels, to act in imitation of the tail and fins of fishes.

The loss of power by the common paddle-wheel has always been exaggerated, and it is only within a few years past that the action of the paddles on the water has been understood. The general promulgation of this error led to many suggestions for avoiding the evil consequent upon the paddles entering and leaving the water at an inclination, (which was supposed to occasion great loss of power,) by arrangements to cause the plane of the paddles to be always parallel to each other, and vertical. This has been effected by eccentrics and by cog-wheels, the paddles in all cases being attached to the arms of the wheel by journals. The investigation of this subject has demonstrated that, considering the compound motion of the vessel and the wheels, the radial or common paddle enters the water at an angle as favorable as the vertical paddles—thus giving an equal effect, without the complexity of machinery; but, notwithstanding this fact, ingenious men continue to apply their time and labor to modify this principle, with the vain hope that it will supersede the common paddle-wheel. One modification of this principle has been patented, and, to a certain extent, introduced in England. It consists in so arranging the eccentric, and connecting it with the paddles by levers, as to cause the paddles to enter and leave the water at an angle somewhere between the radial and vertical paddles. The essays made with this wheel have shown that it only acts little better than a common paddle-wheel when the vessel is subject to great changes of immersion; and as the machinery is complex and exposed to the action of the waves, and therefore liable to be deranged more frequently than the common wheels, they have not been generally introduced.

The importance of placing the propelling agent beyond the action of the waves, was to some extent considered at the period of the introduction of steam navigation in England, and a vessel was constructed with the propelling wheel placed below the water, by arranging it in a case built within the vessel, and opened at the bottom, so as to have only a portion of the wheel project below the vessel; and, with a view of avoiding the resistance of the water to the motion of the paddles within the casing, the water was kept out by forcing air into the case. This was abandoned after many trials on the Thames. But since the application of steam to war vessels, and those intended for long voyages, the importance of placing the propelling agent beyond the reach of waves and shot has become more manifest, and has given rise to many inventions, some of which have been applied, and others only suggested and patented. Under this new impulse, the inclined or screw-paddle has been revived and modified. One of these modifications has been applied to a war steamer constructed by the Government, and to several small vessels by companies and private individuals. Another modification has been applied to the largest iron ship ever built in the world, (the Great Britain,) and other modifications have been applied to vessels of small class in England and France.

Another submerged propeller, essayed by the Government and applied to a medium sized war-steamer, consists of two paddle-wheels placed horizontally, one on each side, below the water-line, and working in water-tight cases built within the vessel and opened to the water at the side, for a portion of the wheel to project beyond the side of the vessel. The paddles in these wheels, instead of being applied to arms in the usual way, are attached to a hollow drum.

Another method, which has not yet been tested on a large vessel, differs from the above, in having the paddles to slide in and out, in recesses made in the drum; so that when the paddles enter the casing, they are drawn in flush with the periphery of the drum, and are pushed out when leaving the casing, to act on the water outside of the vessel.

Others have the paddles attached to arms projecting from the drum by journals, so that they can, by means of cams, be caused to present a feather edge in passing through the casing, and the full surface when outside the vessel.

And another plan has been lately patented, which consists of two rotating plates arranged on the bottom of the vessel, and provided with hinged paddles, or flaps, kept closed or folded up even with the surface of the rotating plates, to which they are hinged, by the resistance of the water during a portion of their circuit, and thrown out by a cam or inclined plane during that portion of their circuit in which they are required to act on the water to propel the vessel. The cams that throw out the paddles are so arranged that their positions can be shifted at pleasure, and thus throw them out in any position relative to the keel; and, in this way, propel the vessel forwards, backwards, sideways, or quartering.

Propellers have been made in every variety of form, to imitate the action of animated beings in passing through the water, with the idea that the Creator, in the infinity of His wisdom, had given the best examples of motion in animated nature, and that therefore the best imitation of these would be the most perfect method within the reach of man's ingenuity. This reasoning would have been correct, if motion had been the only design in the creation of animated beings; but the rotating motion, demonstrated to be the most perfect for great velocities, (for it is continuous, whilst the others are intermittent,) is inconsistent with the organization essential to their being. We find infinity of wisdom in all the examples of nature; but, to employ these to advantage, we must first understand the designs of creation. Without this, the fate of mere chance awaits us. Where, then, should we look for an example of great velocities in nature? Where great velocity is indispensable—not in animated nature, where this motion would cut off all the ligaments and circulating organs; but to the solar system, where we find the rotating motion.

Of the thousands of essays which have been made to propel vessels by imitating animated nature, I have not heard or read of the success of one; and it is with the hope that these first principles may be considered and understood by those who are now wasting their time and means in these pursuits, that I have thus digressed.

A great variety of improvements have been made in all the implements used in the construction and management of vessels, such as capstans, windlasses, anchors, blocks, and tools employed in ship-building; and I regret that the want of time forbids my calling your attention to them more particularly.

Utilitarianism is not the only thing that marks the progress of inventions. Humanity claims, and has received, a large share of it.

In the latter part of the last century, attempts were made to construct life-boats to sustain the action of the roughest sea, which were at first very imperfect; but, by degrees, they have been so improved that a small boat, such as are now constructed, can live in the most agitated sea, and amongst breakers, with perfect safety. There are air-tight metallic tubes and cases arranged inside of the boat, which is pierced with holes in the bottom, that the water washed in by the waves may pass out; the buoyancy of the boat depending upon the air-tight tubes and cases within. Life-preservers (an invention of modern date) have been very much modified. By the use of India-rubber cloth, a great variety of articles, water and air-tight, have been made to sustain the body in water. Belts, jackets, beds, chairs, sofas, and other articles of dress and furniture used on vessels and steamboats, may be rendered buoyant either with inflated India-rubber cloth, or with cork.

As a life-preserver made of India-rubber cloth would be rendered useless by the least puncture, jackets lined and filled with cork shavings have been substituted. And lately a patent has been granted in Europe for making belts and other articles buoyant, by means of a spiral spring covered with water-proof cloth. When the spring is drawn out, there is no necessity of air to inflate it.

Sub-marine operations have been greatly facilitated by the invention of diving dresses, which envelope the whole body, and enable a man to remain under water for a long time, and move about with ease; a communication being kept up with the air above, by means of tubes to keep up a circulation of air. Several patents have been granted for various modifications of these dresses, which have entirely superseded the old, cumbersome, and inconvenient diving-bell.

Until within the last twenty years, *dry docks* had made scarcely any progress. Large permanent structures of sufficient capacity to receive one or several vessels, with gates, into which vessels were floated, and then the water pumped out; and the old Dutch cammel, consisting of two rafts of water-tight cases partly filled with water before attaching them to a vessel, and then pumped out to raise the vessel and float it over bars and shoals, are all that had been applied to use until the last twenty years; but since that time wonderful progress has been made.

First, an inclined railway was used, extending to a sufficient depth below the surface to enable the vessel at high water to be floated on to a cradle, fitted to the rails with truck-rollers, and to the bottom of the vessel; and then, by means of powerful engines, or capstans, the whole mass was drawn up.

Afterwards, as a substitute for the inclined railway, the cradle, with the vessel resting on it, was lifted up vertically by a set of screws on each side, each set being geared together to insure equal action. The friction of all these screws, with an enormous weight resting on them, was a very serious objection; as also the cost of so large a number of screws. It was afterwards improved by attaching a number of chains to the cradle on each side, each chain passing over a roller, and all those on one side attached to a single one, which formed the connexion with a large screw; and this was, in like manner, greatly improved by substituting for the

screws two of Bramah's hydraulic machines. Under this last modification, it was for a long time employed.

Prior to the invention of these, and during their progress, several patents were granted for various modes of constructing *floating dry docks.* At first they were made in the form of a large flat-bottomed vessel, with sides sufficiently high to extend above the water when the bottom was sunk deep enough to receive the vessel to be raised, provided with gates, which were to be closed preparatory to pumping out the water. The walls or sides were made double, to admit water to assist in sinking the whole mass. This has of late been very much improved, by dividing the space between the double sides into separate compartments, connected by pipes governed with cocks, to regulate the admission and discharge of water, together with other and minor modifications; which, in the aggregate, are very important. Another method of constructing floating dry docks was in progress of improvement at the same time as the preceding. At first, it consisted of a number of water and air-tight cases placed under a platform for the reception of the vessel to be raised. These cases were open at bottom, and provided with valves at the top. By opening these valves, the whole mass would sink; and, after receiving the vessel, the valves were to be closed, and then air pumped into these cases, by which the whole mass was raised. This method has undergone many changes; but the most important one is known as the "sectional dock," used on the western waters and on the Atlantic coast. The whole dock is divided into sections, which can be connected together and disconnected to suit the size of the vessel to be raised. Each section consists of a large water-tight case of greater length than the width of the largest class vessels intended to be raised. These cases are divided into compartments, connected together by pipes governed with cocks; and at each end of the cases there is an air-tight box, which slides up and down, to balance the dock. These end or balance boxes have been variously modified, and many of the modifications patented.

A dock has also been planned, which consists of a series of air-tight tubes arranged under a platform, the whole series being connected together in such manner as to admit or discharge water from any portion of the series, to regulate the rising of the dock.

And, finally, it has been suggested to combine a floating dock with a series of railways on shore, that vessels can be raised by the dock and deposited on cradles running on these railways, and thus repair or lay by any number of vessels at the same time.

Before closing this section, it may be well to remark that the completion of the Croton water-works, in New York, led to the suggestion of a mode of docking vessels, (invented by Thomas Jefferson many years ago,) by making use of a head of water to raise a vessel, on the principle of raising boats in a canal by means of locks; but, on examination of it, the original cost of construction will be found too great, compared with the cost of constructing and working the floating docks.

5 h. CIVIL ENGINEERING AND ARCHITECTURE.

If we look at the condition of civilized nations, we find a marked difference between them in all that relates to the internal condition of their agriculture, manufactures, mines, and commerce. Some have only developed

these resources on the seacoast, and along the shores of their natural water channels, while others have developed them equally throughout the extent of their territory. The philosophic mind, in observing this vast and striking difference, must come to the conclusion that the changes produced by the introduction of navigation along the natural channels, in the development of liberal ideas, agriculture, and the arts, must be produced along the whole extent of the rich valleys of the interior, by the progress of common roads, canals, and railroads. In all ages, the interchange of literature, science, and the natural and artistical productions of different, as well as sections of the same nations, have always stimulated intelligence, industry, enterprise, and, consequently, civilization. It is to the improvements made in the art of civil engineering that these great changes are, in a great measure, due; and to them I wish to call your attention. Prior to the commencement of this century, it can scarcely be said that civil engineering, as a specific profession, was known; and the works of internal improvements were limited to common roads, and few canals, constructed in localities presenting no serious difficulties. However dazzling may have been the military career of Napoleon, his fame as a civil engineer will become more brilliant as that of his military genius fades before the progress of intelligence and civilization; and whilst a trace exists of the road from Geneva to Milan, planned by his genius and executed by his power, no mausoleum will be wanted to recall the memory of the great emperor. Every part of France, and of the nations conquered by him, received new impulses from the construction of great works of internal improvement; but, by his expulsion, this progress was arrested.

England, ever watchful of those interests which confer power and wealth upon a state, soon perceived the importance of works of internal improvement, to bring into close proximity with her great seaports the interior, rich with mineral and manufacturing products; and thus sprung up those magnificent monuments of enterprise, her roads and canals, and that *chef-d'œuvre* of modern art, railroads. It is a matter worthy of special notice that we are indebted to the coal and iron mines of England for two of the most useful and beautiful of modern inventions—the steam-engine and railroads. The rapidity with which railroads and canals were introduced in England, and spread over every portion of her territory, is only surpassed by their introduction in the United States. None but a great people, in the early childhood of political power, could have conceived and executed the idea of spreading these circulating organs through every ramification, to invigorate intelligence and industry by the vivifying spirit of commerce. These examples have since been followed by the older nations of Europe, presenting the striking spectacle of old age receiving wisdom from youth.

Of common roads.—Since the improvements in turnpike roads, by Telford and others, no decided improvement has been made in the construction of common roads; although many valuable improvements have been made in machinery and implements for cutting and forming the surface of roads, of which I shall speak hereafter.

Of canals.—Canals are now constructed pretty much as they were at the commencement of their introduction, although many attempts have been made (partly successful) to substitute some method of elevating the boats from one level to another, for the system of locks, which are only applicable to a limited height of lift, and therefore requiring a multiplication of locks when

canals are constructed over a very uneven surface, such as a mountainous country. The most serious objections to locks are the great delays in passing them, and the large supply of water required in the upper levels of canals, to furnish the transfer of a lockful from the upper to the lower level, for each boat that ascends or descends. To avoid these serious objections, it has been suggested to float the boat into a cradle, or a water-tight case, provided with gates, like a dry dock, arranged for this purpose at each level; and by means of chains, passing over drums, to lift up or let down this cradle, or case, with the boat in it, from one level to the other, by steam or other power; and thus save much of the time lost in the old method. This method has, to some extent, been tested in England, with a single lift of not less than fifty feet, which would require at least six locks. A modification of this plan has, to some extent, been employed on the Morris canal and elsewhere, which consists in uniting the two levels of the canal by means of a double inclined plane railway, the cases containing the boats being placed on wheels.

For a long time the use of steam to propel boats on canals was strenuously resisted, on the ground that the agitation of the water by the wheels would destroy the banks of the canal—an error which was received untested by reason or experiment, and generally believed; but within a few years back this error has been battled, and, to a certain extent, removed. The banks of a canal receive very little injury from the agitation of the water, if this agitation does not reach the banks in waves or ripples, such as are formed by the curved bow of the boat separating the water and driving it towards each bank. It is now a settled question, that two boats of the same capacity—one propelled by steam, and the other towed by horses—both passing through the water at the same speed, will produce no appreciable difference in their effects on the banks. But the great difficulty to the introduction of steam on canals arises from the fact that the paddle-wheel cannot be applied conveniently; if placed at the sides, the boat will be too wide to pass the locks; and if at the bow or stern, it must necessarily be placed at some distance from, and thus reduce the effective length of, the boat. Besides this, in the estimation of some of the most eminent engineers, the location of the wheels at the bow or stern cannot be done without a loss of power, compared with their application at the sides.

Many patents have been granted for various modes of applying the screw, or spiral paddle, either at the bow or stern, for canal boats. And lately a patent has been granted for placing two wheels at the bow, one on each side, with the plane of the paddles at right angles with the general plane of the sides forming the bow. Many boats are now propelled on canals in various parts of the United States, under these various modifications; and the question remains to be settled, which of them will be found the most economical. Other plans are about to enter the field of competition.

These inventions, together with the rivalship between canals and railroads, will finally compel canal companies to adopt some system of steam propulsion, except on canals which pass through very mountainous countries.

Some years ago it was suggested to propel boats on canals by means of a large toothed wheel, (or an endless chain passing around two drums,) to act on the bottom of the canal; but the tendency of these methods to injure the bottom of the canal, led to the suggestion of having the teeth of the wheel act on a cogged rail at the bottom, which did not, however, receive

the sanction of engineers, and the suggestion was never reduced to practice.

Another method was to have a chain attached by each end to the bottom of the canal, and carried around a wheel at the bottom of a boat, similar to the manner of propelling ferry-boats. And again, to have poles operated by slides, or cranks, to act on the bottom. Although these plans cannot be called improvements, yet I have mentioned them to prevent the re invention of devices that look specious, but which cannot stand the test of reasoning or experiment.

As canals often communicate with railroads, the importance of constructing boats capable of being transferred from the one to the other, to avoid transhipment, has, for some years back, attracted the attention of engineers. At first, the bodies of railroad cars were so constructed that they could be lifted from a set of wheels called a "truck," and deposited in the shell of a boat, and *vice versa*, with the goods packed in—this being effected by means of a crane; and latterly this has been so modified, that the bodies of several cars, when put in the water and bolted together, constitute the boat itself.

Another improvement in canal boats, introduced on some canals, is based on a law of the resistance of fluids to a moving body. It has been ascertained that the resistance of water to a body passing through it, is not as the whole bulk, but as the sum of the cross section—that is, the breadth and depth multiplied one by the other; from which it follows, that a boat of three hundred feet in length, and another of fifty feet, the depth and width being the same, will be moved through the water at the same speed, with the same power, except the small difference arising from the friction of the water along the sides and bottom of the boat, which would be scarcely appreciable. This fact led to the construction of boats in sections of sufficient length to pass through the locks, and so arranged that they can be connected together in such numbers as will admit of turning the curves of the canal.

The numerous improvements which have been made in the locks and sluice gates, to facilitate their operation, and to render them more secure, are, in the aggregate, important; but a description of them would require too much space.

Of railroads.—This masterpiece of civil engineering is probably unrivalled in the rapidity of its progress; and, in the importance of the results produced, falls very little short of the most valuable inventions of modern times. While the antiquarian labors to seek some evidence of the existence of railroads among the semi-barbarous nations of antiquity, the utilitarian exercises his ingenuity to render it more subservient to the comfort and well-being of society. Time will not allow me to trace up the gradual improvement of railroads, from the rude structure used to convey coals from the coalpit, to the present perfect system. But let the reader reflect that at first it consisted of two parallel pieces of timber laid in the ground; and then compare it with the present structures, capable of sustaining the shocks and jars of a locomotive with its train of cars passing over it with the swiftness of the winds—and this, too, with greater safety than is presented by any other mode of travelling—and then he will be able to form some conception of the amount of time, labor, and thought, which has been devoted to it. A full history of the various improvements which have been made in the manner of forming the iron rails, and attaching them to the wooden foundation, would in itself require a volume. At first, the ablest engineers planned and

constructed railroads in such manner as to overcome the great inequalities of the earth's surface, by winding around hills, and ascending from one great level to another by an inclined plane—the train of cars being drawn up by stationary engines; but investigations soon taught the inconsistency of these with rapid transits, one of the leading objects of railroads; and now they are all, by means of excavations and tunnels, limited to curves and planes that can be overcome by a locomotive at a speed of at least fifteen miles per hour. As a general rule, this is correct; but it must not be carried to the opposite extreme; for there are some localities in which inclined planes would be advantageous. It must not, however, be supposed that this desirable end has been attained without the invention of important devices in the structure of the locomotive and other cars. The necessity of having the two wheels on each axle permanently attached, was soon ascertained; and as, in passing over a curve, the outer rail is longer than the inner one, it became manifest that the outer wheel, the two being fixed to the axle, would have to slip on a portion of the rail equal to the difference between the length of the two. This manifest defect, destructive to the rail and wheel, and tending, also, to break the axle, and throw the car off the track, was soon remedied by the genius of one of our countrymen, who invented what is known as the conical wheel, now used on every railroad in the world. This beautiful device consists in making that part of the tread of the wheel (the part that runs on the rail is called the tread) nearest the flanch, conical; the distance between the flanches of the two wheels being less than that between the inner edges of the two rails, so as to admit of their vibration from one side of the track to the other. On coming to a curve, the cone of the outer wheel mounts the rail, and accommodates itself to a diameter so much greater than the inner wheel, as is equal to the difference in the radius of the inner and outer rails; thus avoiding the grinding and slipping of the outer wheels, and the tendency to fly off the track.

To effect the same object, a device was invented and patented some years ago, which consists in having several treads on each wheel of different diameters, and in so arranging the rails along the curves as to receive either of these treads—the rails, of course, being of different elevations; the diameter of the tread being proportioned to the curvature of the road. This has not, however, been reduced to practice.

For commercial cities, it soon became evident that branches of railroads should be carried through streets, with secondary branches leading into depots and warehouses. And as this could not be effected by curves, the streets not admitting curves of more than sixty feet radius, the branches turned off at right angles, and were provided with a rotating platform to receive the car and turn it a quarter of the circle, and thus present it to the branch rails. This method was attended with much manual labor, and the great delay was found to be inconsistent with the press of business in a large commercial city.

This led to an invention which is as valuable as it is simple, and for which the inventor should have been liberally rewarded. The inventor ascertained that the difference between the diameter of the tread of the wheel on one side, and that of the flanch of the wheel on the other, formed a cone, which, in rolling, would describe a circle of about sixty feet radius, and that the general width of streets would admit of such a curve in the railroad. To apply this general principle, he arranged the road with

the inside rail grooved, to receive the flanch and allow the tread of the wheel to run on the rail, and the outside rail to consist of a flat plate on which the flanch of the wheel would run, and in this way to enable the car to pass around a small curve with ease and safety.

The great friction of the axles of the wheels on their bearings, in view of the heavy weight of the cars and their load, was the subject of early attention among engineers; and the various devices invented to reduce the friction would fill a volume. These devices generally consisted of various arrangements of anti-friction rollers to reduce the size of the ultimate bearing and friction parts. The objections to all these were complexity, and liability to derangement; and, therefore, preference was given to the old method. But, as the most worthless inventions often lead to happy thoughts, one of the persons engaged in the prosecution of this subject, and a citizen of the United States, after repeated and unsuccessful attempts, contrived the remedy now universally employed. Before his invention, the car was sustained on axles within the wheels, which required the journals or bearings to be of considerable size, to prevent the axle from breaking at that part of the journal farthest from the wheel. He therefore suggested the idea of putting them on the outside of the wheels, by which he was enabled to reduce their size considerably, and thus to save a great portion of the friction. It is a matter of interest to observe what important results are often attained by such simple devices, particularly after so much complexity has been resorted to. This was farther improved (by another person) by so forming the box in which the journal works, as to have the point of the journal bear against the bottom of the box, instead of the shoulder of the axle; and then again by casting the box of iron on a metal pin, by which the surface of the cast metal is chilled, and thus rendered very hard and smooth. An improvement has lately been very extensively introduced as a substitute for the chilled boxes, which consists in running into the cast-iron boxes a composition of metals which has long been known to give less friction than iron or brass; but, as this composition is soft, the boxes of railroad cars could not be made of it, on account of the heavy weight tending to spread the composition; but, by forming the inside of the iron boxes with flanches, and running in the soft compound, it is prevented from spreading out. So important is this improvement deemed, that, by act of Congress, the inventor has received $20,000 for the use of his invention by the Government.

The methods of making the wheels of railroad cars are various; and, although the casual observer would pass this subject by, as unworthy of notice, there are few of so much interest to the engineer. The original expense of making the vast number of wheels used on railroads, although important, is but a secondary matter compared with the action of the tread and flanch of the wheel on the rail, and the rail on these, and also the liability to break; for the last consideration will show the danger attending the breaking of a wheel when a train of cars is moving at the rate of 20 or 25 miles per hour. Safety, therefore, is of the first importance; but this safety must not be attended with too much expense, or else the usefulness of railroads would be neutralized. Weighty as all these considerations are, with reference to the wheels for the cars, they are much more important when applied to the driving wheels of locomotives. When the use of steam was first proposed for driving a train of cars on railroads, it was not supposed by any one that the tread of the driving wheels of a

locomotive, and the surface of the rails, would adhere or bight sufficiently to draw even a light load; and, therefore, various devices were suggested for obtaining sufficient traction—such as having cogs on the wheels, to take into cogs on the rails; and it was not until after various modifications of this method had been tested and pronounced worthless, that it was wisely suggested to ascertain, by actual experiment, what amount of traction could be obtained by the plain surfaces of the wheels and rails. This experiment at once established the locomotive system; but, it was still necessary to ascertain the best method of so constituting the tread of the wheels as to obtain the largest amount of traction. These wheels are now generally made of much larger size than the car wheels, of cast iron, with a wrought iron tread, and the car wheels wholly of cast iron, with the treads and flanches chilled. For certain purposes, such as the transportation of merchandise, requiring the locomotive to draw very heavy loads, it has been deemed advisable to multiply the number of driving wheels; and for this purpose, the first set, actuated by the engine, is connected with the other sets by means of connecting rods, so as to have four, six, or eight driving wheels. These various systems have their advocates, and therefore the question cannot be said to be settled. Friction being as the weight and quality of the surfaces, and not as the quantity of surface, expedients have been resorted to for the purpose of throwing nearly all the weight of the engine on the two driving wheels, when only two are employed; but still the whole cannot be thrown on one set, which is effected with four, six, or eight. One of the chief advantages claimed for the use of many driving wheels, is, that the chilled tread can be used, and the weight of the locomotive distributed over a greater surface; thus doing less injury to the road than when nearly the whole weight is thrown on two.

The severe shocks to which the rails are subjected from the passage of a locomotive with a train of cars, has led to many suggestions for avoiding this admitted evil, by rendering the wheels in part elastic, with spring spokes, which never received the approval of engineers; and latterly, the suggestion has been made and patented for obtaining this end, by putting wood between the periphery of the cast-iron wheel and the wrought iron tire or tread, or by making the tread itself of wood; but I have not ascertained whether these have been essayed.

As the flanch of a small wheel has much less tendency to mount the rail than that of a large wheel, it has been suggested to use small driving wheels, and, in that case, to obtain the necessary speed by means of cog gearing.

The rails of railroads soon become uneven by the inequality of the surface; and to avoid it, improvements have been made, which consist in so connecting the sliding boxes of the axles with the springs which sustain the car, that the wheels passing over an elevation sustain by far a greater portion of the weight than those passing over the depressions, which tends continually to render the road level.

Improvements have also been made in springs, by which their strength is increased with the increase of weight they have to sustain, by which the same amount of elasticity is given under every change of weight; and as a substitute for steel springs, it was suggested by Dr. Church, in England, some years ago, to use cylinders filled with compressed air, and acted on by pistons attached to the body of the car: this has been carried into practice in this country within a few years.

As a substitute for the small cars formerly used in this country, and still used in Europe, we now use long cars, sustained at each end on a separate truck with its set of wheels, each truck being free to turn under the car independent of the other. Cars thus constructed are deemed by our most experienced engineers to be much easier for the passengers, and much more safe, particularly in passing around curves.

In many instances, the several cars in a train are connected together with springs, for the purpose of avoiding the sudden shock given by the locomotive in starting and stopping; and the brakes of all the cars have also been so connected, that when any one car is suddenly arrested, the brakes in the whole train are made to bear on the wheels. As a substitute for the spring connexions, it has been suggested to use cylinders with compressed air, as in the springs for supporting the cars.

To prevent the useless application of time in re inventing old devices, I will remark, that a large number of patents have been granted in England and in the United States, having in view the safety of cars in passing around curves, by so connecting the several sets of wheels, that, in reaching a curve, the several axles shall be thrown in the direction of the radii of the circle; the direction being attained by guide wheels running against the side of the rails, or by the flanches striking against the rails. This general device has been modified in every conceivable manner, and has not proved successful.

The tendency of cars to run off the track (the source of the most serious accidents on railroads) has led to many suggestions, other than those above alluded to, for avoiding this evil—such as having a rail in the middle, with a projecting flanch to be embraced by a projection from the bottom of the car, as also grooves in the sides of the rails, and other such impracticable devices; for it must be obvious that, with such an arrangement, a pebble, or other small obstruction, which, in the present arrangement, would be passed over, would, of necessity, the wheels not being at liberty to rise, produce the most serious results.

Various devices have been patented, and some applied to use, for preventing any serious results from the breaking of a wheel or axle when a train of cars is in rapid motion, by an arrangement of bars, which suspend the broken car to the others.

The calamitous occurrence a short time since, on the railroad from Paris to Versailles, by which so many lives were lost, has awakened general attention to this subject in France; and as railroads have but lately been introduced in that country, it is curious to observe the various accounts given in the French papers of the new and wonderful improvements made to avoid similar accidents on railroads, and to see that most of these are similar to devices suggested in this country under the like circumstances; thus showing that mind in all nations has the same tendency, and that Government and circumstances constitute the great differences in the development of resources.

Several attempts have been made to render the action of the switches dependent on the engineer of the car, who can, by a mechanism on the car, shift the switch, or not, as he wishes to continue on the same track or turn-off; but these plans have not gained favor with engineers, who are of opinion that the best method of preventing the collision of cars, and all similar accidents, is a good police and a well digested system of controls.

Some years ago a proposition was made to the British Government to

transport the mail with perfect safety, and with the swiftness of the wind, by means of air-tight pipes under ground, extending from London to any part of the island; the mail to be enclosed in a vessel fitting the pipe, air-tight, so that, by exhausting the air from the pipe, the pressure of the atmosphere would carry this piston like vessel from one end of the pipe to the other with great velocity. I need not say that this proposition was not heeded; but, within a few years past, nearly the same proposition, in a more astounding form, has been made, patented, and to some extent put to the test. It is to propel cars on a railroad by a piston projecting from the lower part of the car, and fitting a hollow cylinder extending the whole length of the road, and placed between the rails; the connecting piece between the piston and car passing in a slot along the whole length of the cylinder, and closed air-tight by a flexible valve extending the whole length of the road. The pipe being exhausted of air, gives a pressure of about fifteen pounds per square inch on the surface of the piston, which is thus forced forward with its load; the connecting piece opening the valve, which is closed after its passage--the piston being sufficiently far ahead of the opening in the valve not to be affected by the admission of air.

The manner of making the valve air-tight was a source of great trouble, but it has at last been accomplished; and those who have travelled on an experimental road constructed on this plan, speak of its action in very favorable terms; but as the practicability of this plan, in my judgment, is a question simply of expense, the successful operation is not a sufficient test.

Much has been done to lessen the cost of constructing railroads by the invention of labor-saving machinery, such as machines for preparing the various parts of the structure, and in making the road. One of these deserves especial notice on account of its importance, particularly for constructing railroads over a marshy country. It consists of a machine placed on wheels, having two pile drivers and saws worked by a small steam-engine. The wooden piles are driven into the earth at the required distance apart, then cut off to the proper graduation required for the road; temporary rails and cross-ties put on, and the machine moved forward to drive another set of piles, and so on. Several machines on this principle have been extensively used on the Erie, and some of the southern railroads; and some have been constructed for the Russian Government.

Among the wonders of modern art may be enumerated the progress of tunnels, or subterranean passages; and although the art of forming these in the solid earth and rock is not of modern date, yet it was reserved for the boldness and genius of the present century to plan and execute such tunnels under the bed of a river, and through the soft alluvial deposites; and whilst a trace exists of the Thames tunnel, it will continue as a monument to the genius of the civil engineers of the present day.

The operations of the engineer have been greatly facilitated by the invention of machinery applicable to every branch of his profession—such as machines for excavating and removing earth; drawing up trees by the roots, and extracting stumps, in running the line of a canal or road through wooded lands; breaking stones for covering the surface of roads; boring and blasting rocks; and an endless variety of other operations, which the want of time will not permit me to notice.

The operations and improvements of the civil engineer have not been limited to the land and artificial water channels, but they have, with great benefit, been extended to the natural water channels; such as constructing

breakwaters, deepening the channels of navigable rivers and harbors, removing obstructions, and other operations necessary to the safety of navigation and the extension of commerce.

The improvements in dredging machines, for excavating the bottom of rivers, have been very rapid and important; but these are only used to excavate and bring up the earth and mud to the surface, to be thence transported by boats to the shore, &c.; and as there are many localities in which the obstruction consists simply of a sandbar, with deep water all round, it has been proposed to clear these by an arrangement of scrapers and drags, which has been patented, by which the sand, mud, &c. of the bar is loosened and dragged into the deep water, to avoid the labor of lifting it. The obstructions of the Mississippi river, consisting principally of snags, presented the most formidable obstructions to be found in any river yet known. The importance of the safe navigation of this river soon attracted the attention of the Government, and a premium was offered some years since for the best mode of removing these obstructions; which brought together a great variety of ingenious contrivances for effecting this purpose, by cutting them off at sufficient depths under water to afford safe navigation, or pulling them up. None of these were, however, deemed sufficient; but subsequently a twin boat was constructed by Captain Shreve, called the Archimedes, from its great power, which is effective. The two boats are connected together by powerful beams, a sufficient space being left between them to operate on the snags. The forward part of this space is provided with a beam of great strength, covered with iron, and extending across the whole width of the space. The boat is provided with engines of great power, which can be thrown into gear with the paddle-wheels or with windlasses. The position of a snag having been ascertained, the boat is put in motion at the height of her speed, and steered so as to have the beam strike the underside of the snag, which is thus uprooted by the momentum of the whole mass of the boat, and the velocity acquired before striking, constituting an almost irresistible force. The windlasses are then applied, the snag drawn-up, cut into pieces, and suffered to float down the river, or otherwise disposed of.

This, or some other process of removing the snags, will have to be continued in use, until time and population shall have cleared the forests along the shores of this river.

On the subject of bridges, I have only to state that many valuable improvements have been made in the manner of uniting and disposing the timbers in wooden bridges, so as to attain the greatest amount of strength, with the least weight; a description of which could not be made intelligible without illustrative drawings. As it has been demonstrated that the same strength can be attained by means of iron, with less weight than with wood, we are justified in looking forward to the rapid introduction of iron bridges, particularly those constructed of wire ropes as substitutes for chains; the former affording much greater strength, with the same weight of iron, than the latter.

Of architecture.—The infatuated lover of antiquity may point to the ruined temples, and the other architectural monuments of past ages, as evidences that the ancients were superior to the moderns; but the modern rationalist will point to these, and the miserable dwellings of the masses, as conclusive evidence of the absolutism of kings, and the degraded and ignorant condition of the millions; that the intelligence of the ancients was directed

wholly to the luxury of a few, and to the development of taste merely; whilst the modern, without rejecting taste, makes it secondary to the development of those resources which conduce to the intelligence, well-being, and comfort of the whole human race; and, therefore, we find that, although modern architects are merely imitating ancient taste in the beautiful, they have entirely revolutionized what may be termed domestic architecture. And every day brings out some new invention, by which dwelling houses are rendered more cheap and comfortable, and, therefore, more within the reach of the poor classes.

Iron is becoming more and more useful in the construction of houses; and many large buildings in Europe have of late been constructed with iron rafters, as substitutes for the heavy and expensive stone arches in fire-proof buildings. The covering of houses with metal has been rendered so cheap, of late, by the invention of machinery to prepare the plates and form the joints, that we have every reason to anticipate that, in a few years, metal will exclude every other material in covering houses.

It has been suggested to construct portable houses of plate iron for the use of emigrants; and I have no doubt that, before long, this will be effected at so low a price as to render it a profitable business. Wooden houses of beautiful structure, are prepared in the north and east by machinery, and sent to every part of the country, and to the West Indies, and then put up.

But the most decided and important inventions, bearing upon domestic architecture, are to be found in the machines for preparing and working lumber, to which I shall refer in another class.

6th. OF LAND CONVEYANCE, COMPRISING CARRIAGES AND OTHER VEHICLES.

In the preceding class, I have referred to railroad carriages, which belong to this class; but they are so closely allied to locomotives, that I considered the discussion of them more appropriate under the head of "civil engineering," particularly as their use is confined to railroads.

The construction of carriages for common roads has not, since the introduction of railroads, been the subject of many inventions—transportation of merchandise, and travelling, being principally carried on by railroads and canals; and, therefore, I need only say that the improvements which have been made relate to the construction of the hubs and boxes, with the view of giving them more strength, and rendering them more durable; in the manner of uniting the front axletree with the perch; in the arrangement of the springs; in the manner of fastening the wheels on the axles, as substitutes for the linch-pin; in methods of arranging brakes to arrest carriages in descending hills; and in various devices for liberating the horses from the carriage when they cannot be stopped. But as these are not of the first importance, and could not be clearly understood without drawings, and they do not possess any marked character, it is deemed advisable not to attempt any description of them.

For a long time, steam carriages for common roads have been the subject of experiments and investigations in Europe, and particularly in England. But three patents have been granted by the United States on this subject—the first in 1811, and the others in 1823 and 1825, for with the introduction of railroads, every effort ceased in the United States. But not so in Europe, where the subject has been prosecuted with an indomitable perseverance worthy of a more promising object. That a carriage can be propelled on a common road, by steam, no one acquainted with the progress of inven-

tions can doubt; but that this can be done in a manner to compete with railroad transportation, is not believed by the mass of able engineers. In the first place, to make a common road sufficiently level, hard, and smooth, for the efficient action of a steam-carriage, would cost more than a railroad; and then every little pebble becomes an inclined plane to be ascended, much more formidable than is generally imagined by those who are engaged in this pursuit. But it is useless to point out all the objections. The abandonment of this subject by American inventors has been deemed highly creditable to their judgment.

7th. OF GRINDING MILLS, AND HORSE POWERS, &c.

Since the invention of Oliver Evans, which has given him an enviable reputation wherever flour is used, no marked invention in mills has been made, although many minor improvements have been patented and introduced in the manner of dressing millstones, to increase the rapidity of grinding, and insure the better discharge of the flour; in the manner of constructing the spindle which supports the stone, and the parts which form the connexion between the spindle and the stone, as also in regulating the distance between the bed stone and runner, to graduate the quality of flour; and to these may be added improvements in the apparatus for bolting the flour.

Many and valuable improvements have been made in small portable mills, to be worked either by hand or horse power, for the use of farmers—particularly useful in those sections of the country where water power is scarce, and but few large mills erected.

Attempts have frequently been made to substitute, for the common millstones, a cylinder running in a concave, extending around a portion of the circumference of the cylinder, whether made of iron or stone, but without decided success; and, in fact, it is difficult to conceive of anything better adapted to the grinding of grain than the common millstone with the grain fed in at the centre; for, as the grain is crushed and reduced in size, it covers a greater surface, which corresponds with the gradually enlarging diameter of the stone; but in the cylinder mill the surface is the same all around, and, therefore, if the crushing part is in full action, that part which reduces to flour must be choked; and, if the latter is in proper action, a portion only of the former can be effective. A patent has been granted for a mill based upon the principle, that the most effective mode of reducing grain is to strike it with a gentle blow, and then to rub it; which is effected by giving to the upper stone a vibrating motion on its spindle, instead of a continuous one; and at the end of the back action to lift it slightly, and let it fall at the commencement of the direct action. In the incipiency of the experiments, it was spoken of highly; but I have not yet heard the final result.

Repeated attempts have been made to substitute iron or steel grinders for millstones; but the success has only been partial, except as applied to mills for grinding coffee and bark, crushing corn, and other similar operations, where this metal has been very successfully applied. A very large number of patents have been granted for various modifications of corn, coffee, apple, bark, paint, and other kinds of mills for grinding and crushing; but a detailed notice of these is incompatible with this report.

Some of the most important results connected with milling, have been obtained by machines for separating garlic and smut from wheat and other

grain preparatory to grinding; but, as these belong to the class of agricultural implements, they come within the province of the other examiner.

It has always been very desirable for farmers to possess a simple and portable arrangement of machinery for driving thrashing-machines, mills, straw-cutters, &c., connected with the barn, by means of horses—called a horse-power in technical language. The great demand for such a thing has produced a large number of devices—many of which have failed, but several succeeded; and the horse powers now used are really very ingenious pieces of mechanism, that work very well, and have produced very important results in farming operations. There are several in the field of competition, the inventor or projector of each laboring to establish the superiority of his plan over the others.

8th. OF LUMBER, INCLUDING MACHINES FOR SAWING, PLANING, MORTISING, &c.

The inexhaustible supply of timber within the limits of the United States, in view of its scarcity in the territory of some of the most populous nations of Europe, soon rendered lumber an article of extensive consumption at home, and important as an article of export; and hence we find that the people of the United States have done more to improve machinery and tools employed in manufacturing and working lumber, than any other people in the world; and, from the magnitude of the interests involved, every labor-saving machine in this branch of industry becomes important to every section of the country.

Of saw-mills.—There are but few, if any, classes of inventions which have been modified and improved to more advantage than saw-mills, by apparently small changes. Much of the progress in the operation of saw mills is due to improved workmanship, but still more to several inventions connected with the manner of setting the log at the end of each cut—thus rendering the sawing of lumber, from the time the log is put on the carriage until it is entirely cut up, an automatic operation. As early as 1802, a patent was granted for an automatic saw mill, by means of which, after the log had been put on the carriage, the boards were cut off, the carriage run back, the sawed board thrown off, the log set for another board, and so on to the last cut, when the mill was stopped,—and all this by a very simple arrangement of machinery; but such was the incredulity of the world at that time, with reference to labor saving machinery, that this beautiful invention could not be established—the inventor having been one of those who live before their age, and who, therefore, give impulses to industry or mind, which are not appreciated at the time, but which confer great benefits on society after they have gone beyond the reach of earthly rewards. By degrees, the objects this man had in view were introduced one by one; and thirty years after the date of his patent, saw mills reached the perfection of his patent of 1802. This is by no means a solitary instance in the history of inventions.

There is an almost endless variety of methods for setting the logs on saw-mill carriages after each cut, many of which are in successful operation. To avoid the loss of time consequent on the running back of the carriage, it was proposed to have teeth on both edges of the saw, to cut both ways; but, in practice, this did not succeed in the estimation of millwrights.

It has always, since the invention of the circular saw, been desirable to

apply it to the sawing of large logs; but when it is made beyond a given diameter, the cutting edge becomes unsteady—that is to say, in technical language, the saw "buckles;" and to avoid this, guide plates and guide-friction rollers have been placed on each side, immediately above the log, but without success; and, therefore, circular saws have continued to be limited in their use to sawing lumber of small size. Within a few years it has been suggested to avoid the difficulty by using guide rollers, as stated above, and at the same time to give to the shaft of the saw end play in the boxes, to yield to the buckling of the saw, whilst the guide rollers keep the edge steady. This is said to be an effectual remedy.

Another mode of sawing large logs with circular saws, which has been patented, is to have one small saw above, and another below the log—one being forward of the other, to permit each saw to cut little more than half the thickness of the log without touching; but the great difficulty of making two saws, thus arranged, cut perfectly true, so that the karf of the two shall correspond precisely, together with the additional complexity and trouble of keeping two saws in order instead of one, have prevented this device from getting into general use.

The use of circular saws in cutting veneers will be referred to under the head of "veneer cutting."

The admitted advantage of a continuous operation in sawing, instead of the reciprocating, led to many devices which have repeatedly been reinvented, and that have failed as often as they have been tested. One of these consists of a steel belt, with teeth on one edge, and passing over two drums or rollers, and sufficiently stretched to make it run straight between the two rollers. The defect in this is the tendency to break, and the great amount of friction arising from the tension necessary to make the cutting part run straight. A modification of this, and more practicable, is to attach a saw to two chains that pass over the drums, or segment of drums, at the end of two vibrating beams. Another method consists of a flat chain, with teeth on one edge, and passing over two drums, the joints being in the direction of the width. The great expense of making such a saw sufficiently thin and accurate, and the constant liability to break, are the practical objections to this otherwise ingenious plan. And the last method resorted to, consists of an annulus, (or, in other words, a circular saw, with the inner part of the disk cut out, and therefore without a shaft,) and driven by surface-rollers pressing against both sides or faces.

In devising new methods of making and working saws, too little attention is given to those difficulties which are wholly of a practical nature, and which are not to be avoided; and therefore we often see very ingenious plans of saw-mills, against which no possible theoretical difficulty can be advanced, fail entirely when put to the searching test of experiment.

Forming the teeth of saws for saw-mills has been a fruitful source of inventions, to reduce the power necessary to cut the wood, to leave the surface of the wood in a smoother condition, and to insure the accuracy of the cut; but these do not seem to have met with much favor with those who work saw-mills.

The power necessary to move the carriage of a saw-mill with a heavy log on it, is very considerable, and has led to many suggestions to avoid it. The carriage has been placed on rollers working in the floor of the mill, or in the bottom of the carriage, with side-guides to insure the carriages running true. And again, as a substitute for these, it has been sug-

gested to move the saw and saw-frame towards the log, instead of moving the log towards the saw. These various plans have their advocates, and some of them are in operation, and others are under trial, and will receive those tests which soon decide the merits of an invention.

Various plans have been resorted to, to avoid the necessity of using the gate or frame in which the saw is held and stretched, and one of these has been extensively used where the waste of timber is not essential. It consists in attaching a block at the upper and lower ends of the saw, which work in slides, the lower block being attached to the pitman; and, to insure the working of the saw accurately through the log, guides are placed on each side of it, above and below the log. To prevent the saw from bending, it is made of greater thickness, and therefore requires more power to make it pass through the wood than a thin saw; but it is cheaper than the gate, and therefore is often used. Another method of dispensing with the gate, is to attach the saw to the extremity of two arms projecting from two rocking shafts; the plane of the saw being nearly in a line with the length of the arms; there being corresponding arms on the rocking shaft, and opposite to those holding the saws, the outer extremities of which are connected with a rod and screw, to strain or stretch the saw.

In some instances, the gate itself has been suspended to arms projecting from rocking shafts, to avoid the friction of the gate working in slides.

Within a few years, it has been deemed highly desirable to make portable saw-mills, to be moved about where timber is found, instead of transporting the logs to the mill. Several patents have been granted for various arrangements, by which saw-mills are rendered portable, and worked by horse or steam power, which are in successful operation; but these arrangements could not be described clearly, without drawings.

The various forms given to ship-timbers are attended with great labor, and have heretofore been done wholly by hand; but patents have been granted for arrangements of saw-mills, by which the mill can be set to cut any form desired in the building of a ship, with much less labor, and with all the accuracy, which can possibly be given to it by hand. This is a matter worthy the consideration of those engaged in ship-building.

The branches of industry to which modifications of the saw-mill have been applied, are very numerous, and will be noticed under separate heads.

Sawing and cutting veneers.—Formerly, the thin slabs or sheets of choice woods for overlaying furniture were sawed wholly by hand, and the first attempts to saw them by power machinery was with a modification of the common saw-mill. And when this was so far perfected that veneers of one-sixteenth of an inch in thickness were cut, the art was supposed to have reached perfection; but now they are often cut of the thickness of one-fortieth of an inch—a little thicker than a sheet of writing paper. Soon after the invention of the circular saw, this ingenious and useful instrument was so modified as to cut the finest veneers, from logs of any diameter, in the following manner: An iron disk, of any required diameter, is attached to the end of a shaft, with the outer face perfectly flat, and the other curved, commencing with a considerable thickness at the shaft, and reduced to a knife edge at the periphery. A number of thin steel plates are screwed to the flat side of this disk, with their outer edges projecting a short distance beyond the periphery of the disk, and cut into fine teeth. The saw thus constructed rotates with great velocity; and the log, fixed on a well-adjusted carriage, moves in a plane parallel with the flat

face of the saw, and the sheet cut off is curled up in a cylindrical form by the curved face of the disk. A saw of this construction can be made with the cutting edge very thin, and therefore the amount of wood wasted is very small; but even this, small as it is, was enough to induce efforts to save it; and many improvements have been made and patented on the Russian method of cutting veneers, by means of a sharp knife forced against the wood, and taking off a thin sheet, in the same manner as a plane cuts a shaving. After many attempts, however, it was found that this could not be done effectually without first steaming the block of wood, by which it is rendered soft and more yielding. Various modifications of this method are now in operation, but with more success when applied to the more common and soft kinds of wood than to rich mahogany.

As it is necessary, for all these methods, to slab or square the log (as it is termed) before cutting the veneers, a very ingenious device was invented, which consists in cutting the veneer from the circumference, instead of the diameter of the log. The log is attached at one end to a mandrel, and at the other turns on a centre pin, and is presented to the saw or cutter by rotating the mandrel, which gradually approaches the saw or cutter; so that the sheet of veneer is cut off as a sheet of paper unwinds from a roll.

Cutting shingles and clap-boards.—These articles have always been manufactured and consumed in great quantities in the United States, and constitute important branches of industry in the lumber regions. Even prior to the invention of the circular saw, machines were in use for sawing them from the solid block, by an arrangement of machinery very similar to the saw mill, and differing from it only in the arrangement of the carriage, by which the block is so presented to the saw as to cut the butt, or thick part of the shingle alternately from opposite ends—and first from the top, and then the bottom, for clap boards; but as soon as the circular saw was invented, it was applied with great advantage to these machines, and clap-boards were then cut directly from the log, by sawing from the periphery towards the centre. Modifications of these machines have from time to time been patented and introduced, and have greatly simplified their construction, and improved their operation.

Sawed shingles have always been considered inferior to those made by riving and shaving; and hence many machines have been invented and used for performing these operations with astonishing rapidity and accuracy. But this compound operation was deemed too slow for this age of improvements; and, therefore, machines have been made, and are now in use, for cutting them from the solid block at one operation, on the same general principle as the method above described for cutting veneers.

Making barrels and casks.—The great demand for barrels during the late war, together with the scarcity of workmen, first suggested the idea of making them by machinery, which has ever since been progressing. The method first proposed, was that of shaving the staves, by taking what is termed the bolt—that is to say, the slab of wood prepared for making a stave, by splitting from the block—and forcing it through a machine, consisting of a series of plane-irons, arranged nearer and nearer together, to reduce the thickness of the wood, and gradually reduce it to the shape required for the inside and outside faces, and then forcing it through another set of knives for jointing the edges. By a third machine the pieces to form the heads were dowel-pinned, and then turned of the required form and size. By this arrangement of machinery, very little time and labor were saved, as an

expert workman could shave the stave nearly as fast as it could be passed through the machine; and therefore this system was not finally successful, and is only interesting as forming the starting-point in the application of machinery to this branch of industry—the importance of which will be appreciated when we consider that there are upwards of fourteen millions of casks, barrels, and kegs made every year for use within the limits of the United States, besides those for export.

The waste of timber, together with the difficulty of procuring it of sufficiently straight grain to split into staves, have always presented strong inducements for the invention of some system of making barrels without splitting. The most obvious method of effecting this was by sawing; but as the grain of the wood very frequently runs diagonal to the direction of the grain, staves thus made, it was obvious, would be very liable to break in bending. This led to the invention of various devices for sawing them in the curve required, to avoid bending, by means of a plano-convexo circular saw—or, in other words, a circular saw dished; but as the stave is cut on one side of the shaft, it is manifest that the stave must be of an imperfect form. About the same time was invented a saw, for the same purpose, which avoids this difficulty: it is in the form of a barrel, with saw teeth on one edge, and attached to a shaft at the other. And, subsequently, another in the form of the segment of a hoop, attached to arms projecting from a rocking-shaft, which required the saw to be of considerable thickness to be stiff enough to force its way through the wood without bending. This was subsequently modified by making it an entire hoop, and running it on a set of rollers, sufficiently far apart on one side to admit of the passage of the stave. In all these methods the saw cuts the stave in the curve of the diameter of the barrel; and as the carriage which carries the block of wood moves in a curve corresponding with the bulge of the barrel, of course the stave is cut of the form required without bending. But all these are limited to the cutting of one or two staves at each operation; the very structure of the machines not admitting of a multiplication of cuts, and the longitudinal curve of the stave must be a segment of a circle, instead of making it with the bend in or about the middle, and the ends straight—or with straight quarters, as it is termed by the coopers. To avoid these real or supposed difficulties, a machine was invented, which consists of a gang of straight saws, hung in a gate like a saw mill, but capable of turning on their longitudinal axis, and all connected together, so that the vibration of one will cause the whole to vibrate; the space between each saw being equal to the thickness of the stave to be cut. A block of wood is put on a compound carriage, which has two motions—one at right angles to the other: the lower one moves longitudinally, and the upper one transversely; each end of the latter embracing a guide of the desired form of a barrel stave; and, in this way, the block, in moving from one end to the other, is made to describe a curve the reverse of the guides; at the same time, a guide, attached to the side of the lower carriage, and connected with the saws, causes them to follow the direction of the curve described by the block, and thus to make as many cuts of the same curve as there are saws in the gang. The staves thus cut are not, however, curved in the direction of their width; and therefore the barrel, instead of a circle, will be a polygon of as many sides as there are staves: thus bringing the whole strain of the hoops on the joints.

Staves made by machinery are jointed by a machine that is beautifully

simple. It consists of two circular saws, whose planes are in the radii of a circle, the centre of which corresponds with the centre of the barrel, and therefore the two edges of the stave cut by these saws will form the joints of the barrel. In the estimation of some coopers, the inside of the joint should be tighter than the outside; and to effect this object, the outer bearings of the saw-shaft receive a slight movement during the jointing of the stave. Various other methods of jointing staves have been patented and used, which consist of arrangements of cutters or planes to give the required form to the joint; but the arrangement of saws is generally preferred and employed.

Several patents have been granted for machines for turning the heads; for forming the ends of the staves to receive the heads, either on each stave separately, or on the whole at once, after the barrel has been trussed; and for forming the hoops.

Staves are now also made by cutting with a knife from steamed timber; the knife for this purpose being attached either to vibrating or rotating arms, whose centre of motion corresponds with the centre of the barrel to be made; but staves thus made are only used for dry barrels.

Planing lumber.—Machines are now, and have been for some years back, in successful operation for planing the surface of planks; and also for tonguing and grooving the edges at the same operation, by means of rotating planes, working with great velocities, whilst the board moves towards the plane with a motion comparatively slow. There are few inventions which, in the commencement, presented more practical difficulties, and which have, in the end, proved more successful. At first, a series of plane-irons were affixed to the face of a wheel, or the rim of a wheel, passing over the face of the boards in curves, which did not prove successful; but when the plane-irons came to be arranged with the cutting-edges parallel with the shaft, and separable from it, for the purpose of grinding, and so arranged as to admit of the discharge of the shaving, then it succeeded admirably.

A machine, which has, to some extent, been, and is now used, has the plane-irons attached to the face of a conical wheel, so that it partakes of the general character of the two systems above described.

The successful operation of planing machines illustrates, in a remarkable manner, that apparently trifling circumstances will render an invention eminently useful, or cast it aside as utterly useless. At first, planing machines were made with the plane-irons working in the direction of the motion of the board, and in this way they cannot operate successfully; but by simply reversing the direction of the motion of the cutter wheel, to make the cut against the motion of the board, it works admirably. This shows how careful engineers should be in condemning or approving any new invention. The whole history of inventions is replete with such lessons of prudence; and it is only necessary to refer to the memorable fact that Fulton, in the application of steam to the propulsion of boats, succeeded where others had failed, by simply changing proportions. Planing machines have been applied to various purposes besides planing flat surfaces, and tonguing and grooving; as, for instance, in cutting mouldings and making window-sashes, in cutting dove-tails for uniting the edges of boards, (principally for making boxes, to avoid the necessity of nailing the pieces together,) facing ship timbers, forming the handles and beams of ploughs, and a variety of analogous operations.

It may be well to remark, that many patents have been granted for various methods of planing, which have not been put in successful operation. These have generally been on the principle of forcing a cutter similar to a hand plane (one or several in succession) over the surface of the board, by means of a reciprocating carriage, or an endless chain, or by passing the board over one or several permanent planes.

Mortising and tenoning.—These operations were formerly done by means of the hand-chisel, and mallet, and saw; but, by means of a succession of improvements running through a period of several years, they are generally performed by machinery, and a mortising and tenoning machine is now as essential a part of the carpenter's tools as a plane and saw.

Cutting irregular forms.—All irregular forms in wood were formerly produced by hand; but now, all articles that have a definite form, and that are to be made in great numbers, such as gun-stocks, ship-blocks, shoe-lasts, &c., are made in a machine, from a pattern, by means of rotating cutters, with great expedition. A pattern, made of iron or hard wood, is put on the mandrel of a machine, and the piece of wood to be worked up on a corresponding mandrel. A cutter-wheel and a guide-wheel, working in a separate frame, are presented—the former to the wood, and the latter to the guide. The two mandrels are made to rotate very slowly, and the cutter wheel with great rapidity; the frame of the cutter and guide wheels being caused to move slowly from one end to the other, and being free to move from or towards the centre of the two mandrels, and only pressed up by a spring; and thus it will be perceived that the inequalities of the pattern, as it rotates, causes the guide wheel, which is pressed up to it by a spring, to accommodate itself to the irregularities; and as the cutter-wheel is in the same frame, it receives the same motions, and therefore cuts the piece of wood to the form of the pattern. It is in this manner that gun-stocks are made at the United States armories, and elsewhere. Shoe lasts, and all irregular bodies of similar character, are also made in this way. And, latterly, a modification of this has been applied to the turning of boat-oars.

Articles of a cylindrical or conical form are also made by machinery, but of a more simple construction. The piece of wood is put on a mandrel, and is acted upon by a cutter, which travels from one end to the other, whilst the wood rotates, and is kept from warbling by a rest, which embraces it, and travels with the cutter. And when this is applied to turning conical articles, a guide causes the cutter and rest to approach each other as they travel from end to end. In this manner broom and whip handles are turned with great expedition, and consequently at very low prices.

Ship-blocks are now almost wholly made by a combination of machines and tools, based on a system invented and patented in Europe by the celebrated Brunel, the engineer and deviser of the Thames tunnel—the masterpiece of modern engineering. When this system of ship-block machinery was invented by Brunel, he submitted the plans to his Government, at Paris, who treated him and his inventions with contempt. He then passed over to England, where he was received by the Government with marks of distinction; who, with a liberal reward, authorized him to establish this beautiful system at Portsmouth, where it is still employed. The inventor, since that time, has ranked among the ablest of British engineers. These machines have been greatly simplified in the United States, and are now extensively used.

Coach making.—This branch of the mechanic arts, like the preceding,

has been greatly improved by inventions. The felloes of the wheels, and other parts of carriages, are cut to the required form by means of saws, or turned from segments by tools variously arranged. The spokes are turned by means somewhat similar to the turning of gun-stocks. The tenons are cut, the hubs turned, mortised—and, in short, every part of the wheel prepared by machinery. In some of the large coach-makers' shops of the north, nearly every part of a coach is made by machinery; so that the workmen are rather directors than executers of the work.

9th. OF FIRE-ARMS, AND IMPLEMENTS OF WAR, INCLUDING THE MANUFACTURE OF GUNPOWDER AND SHOT.

The extreme prudence necessary to be observed by officers in the selection and adoption of fire arms, and other implements of war, no doubt has retarded the progress of improvements; but when we consider that on this selection depend not only the lives of thousands, but the safety of nations, we shall come to the rational conclusion, that a retardation occasioned by a wise prudence is preferable to a progress resulting from a rash choice. An able and experienced officer has given it as his opinion, that no implement of war, however promising, should be generally adopted until it had been tested in a small corps during at least three campaigns. It must be evident, that where such delay is demanded by a wise prudence, it must necessarily retard the progress of improvements. Hence, we find that improvements in machinery for making them have been much more rapid than in the fire-arms, and other implements of war.

Many attempts have been made to improve the cannon, and render it more efficient, by making the chamber, which contains the charge, separate from the barrel; which gives the direction to the ball, either by having the chamber to slide in a breech plate, or by having several chambers attached together, and rotating in a frame at the breech; so that each chamber can be brought in succession to the barrel to be discharged. These two general principles have been variously modified, and frequently re-invented and tested, and as often condemned by experienced and scientific officers. Improvements have been made, or rather modifications in the proportions, suggested by scientific investigations and well conducted experiments. The most decided improvement of modern times, connected with gunnery, is the discharge of shells from a cannon of large calibre, instead of throwing them up at great elevations, to have them drop where required; the shell being provided with a fuse, proportioned to the distance of the object fired at, or with an explosive mixture, to insure the explosion of the shell when it strikes. This is, without comparison, the most destructive implement that has ever been reduced to practice. The difficulty of regulating the fuse, to insure the explosion of the shell at the time it reaches the object fired at, has led to many suggestions for dispensing with the fuse, and substituting some device that will ignite the contents of the shell, by the percussion of the blow when it strikes. The difficulties in the way of attaining this object, are the danger of explosion by handling the shells during the confusion of an action, and by the discharge of the gun.

The supposed superiority of wrought over cast metal for cannon, has directed attention to the means of working this metal to insure the welding or union of all the pieces of which the whole must be composed, without a flaw; and thus constitute large guns less liable to burst

than those made of cast metal, and at the same time to harden the inner surface to avoid the injurious action of the cast-iron balls. This was, for a long time, believed to be impossible, and every attempt resisted; but the progress which has been made in the art of working wrought iron has led many to believe that it can be done. We now know that the largest masses can be welded effectually by means of the steam-hammer, (referred to in the first class,) which works with more power and greater rapidity than the hammers previously used. This, together with a better knowledge of the properties of metal, and the better management of heat, leaves less doubt of success for small cannon. As to rendering the bore sufficiently hard to resist the action of cast-iron balls, it is in more doubt than the preceding. Experiments are in progress, having in view the lining of the bore with cast-steel; but whether this will be successful, is a question purely of experiment. But things apparently as difficult, and presenting as many obstacles, have been surmounted; and therefore we have no right to say this will not. In a large wrought iron gun, lately made for the United States, this difficulty has been surmounted by turning the ball, and covering it with buff leather; it is under essay, and therefore we may anticipate early intelligence of the result.

After the application of percussion powder for the priming of small fire-arms, many attempts were made to apply it to cannon. At first, it was exploded on the touch-hole with a hand-hammer, and subsequently by a regular percussion-lock.

The loss of force in guns, through the touch-hole, together with the inconvenience of the smoke thus thrown out on board ship, led to many devices in cannon-locks to close the vent by the hammer used to discharge the gun, and at the same time prevent the admission of air through the vent whilst ramming down another charge. But in every instance these devices have been condemned on trial; and now, the percussion-locks used are so contrived, that the moment the blow is struck, the hammer passes off from the vent, and leaves it free to discharge.

Very few improvements in gun-carriages have been reduced to practice, although this subject has given rise to many inventions. As it is more important to have good gun-carriages on shipboard than on land, because of the greater difficulties to be overcome, so it has been the subject of more research. The great objects to be attained in a carriage for shipboard, are great strength, durability, range of action, broad base, light recoil, and easy movements for working the gun. It must be evident that this is a formidable array of requirements and difficulties; and, of all the attempts in England, France, and the United States, until lately, the whole may be said to have failed. There are, however, two arrangements, invented by different persons, now under trial—one of which I have examined with attention, and find to present much merit; and as both are spoken of in high terms of commendation, and are under trial, we shall soon hear the result.

Of small fire-arms.—In these, as in the preceding, many attempts have been made to facilitate the means of loading, by having the breech part movable to receive the load—as in Hall's rifle, (extensively used by the United States,) in which the chamber that receives the charge is thrown up to receive the charge, and then forced down; the bore of this chamber being larger than the bore of the barrel. This has undergone many variations, but Hall's arrangement is still preferred. To avoid the necessity of loading after each discharge, as early as the beginning of the present century it was pro-

posed to have several chambers attached to, and either parallel with or radiating from a common axis, and connected with the barrel in such manner as to be capable of rotating to present each chamber in succession to the barrel. These two principles have been re-invented several times, and, within a few years back, have been manufactured very extensively for private use, and to some extent tested in the army; but with what success I am not informed. As a modification of this, pistols are now manufactured in the United States, which consist of several barrels united together, and rotating on a cylindrical pin projecting from the stock, and so arranged that the same lock discharges each barrel in succession, and shifts the barrels by the operation of cocking. Guns and pistols are also made with a sliding piston, instead of the screw breechpin—a hole being made in the upper part of the barrel, through which the charge is introduced when the piston is drawn back, the hole being closed by pushing the piston forward. The levers by which the piston is operated are so arranaged, that when the piston is forced up ready for the discharge, the force of the discharge cannot push it back.

Although percussion caps for priming have been universally introduced for private use, they have always been objected to for military purposes, and only introduced to a limited extent. A continuous primer has been invented and patented in Europe and the United States, which promises great success, as it has, after many trials, been adopted by several Governments. Fulminating or percussion powder is put in a lead or tin tube, which is afterwards flattened, and placed in a hole made in the under part of the stock; from thence it passes under a toothed wheel, pressed up against it by a spring, (the distance between each tooth being equal to the length of priming required for each discharge;) the cock or hammer of the gun being provided with a cutter, which cuts off a piece from the strip, that is immediately caught by the hammer, and exploded against the face of the nipple. By this arrangement, the gun cannot be primed unless it is cocked, as the strip cannot be introduced between the hammer and nipple. I have been informed that this plan was submitted to a test of one thousand consecutive discharges with the other methods of priming and discharging, and that this is the only one that did not fail a single time.

Many patents have been granted for various arrangements for percussion and other locks—all of which have, by degrees, simplified gun-locks, and rendered them less liable to derangement. Since the efforts of Jacob Perkins to substitute steam for powder, in discharging balls, nothing has been done towards this end; and it is very doubtful whether he would have undertaken it, had he anticipated one half the obstacles which he has been unable to surmount. As we have heard nothing on this subject of late, it is hoped he has directed his genius towards other objects, which may yield more substantial returns for ingenuity and perseverance.

It is a remarkable fact, which illustrates the adverse tendencies of different minds, that whilst Perkins was exhausting mind, money, and happiness to avoid the dangers consequent upon the use of gunpowder in ordnance, others were making efforts to avoid the dangerous use of steam, in the steam engine, by substituting gunpowder. Amidst other efforts at dispensing with the use of gunpowder in throwing shot, I may refer to one in particular: it consists of one or several arms attached to a shaft, and rotating with great velocity in a horizontal case, provided with a hopper above the centre of the shaft, and a tangental pipe or barrel at the periphery. The shot are put in the hopper, caught by the rotating arms, carried out by the

centrifugal force, and discharged through the barrel—the shot receiving an accelerated velocity from the time of its entrance until discharged. This device was the subject of much discussion a few years since; was several times tested; but, for the last two or three years, I have heard nothing of it.

The application of the electric spark, developed by a galvanic battery, to discharge shells laid in the channel of rivers or harbors, at the distance of several miles, has been tested at home and abroad. It is the belief of many that this general idea is destined to become the source of perfect safety against attacks of naval forces; whilst others are of opinion that, by means of drags properly arranged, the enemy can cut off all communications between the shells under water and the battery.

In casting shells, it is important to have them of such thickness as may be decided upon—if desired of an equal thickness to insure this; and, if of unequal thickness, to have the inequality correspond with the design or pattern. To effect this with sand cores, made by hand, is very difficult; but a patent has lately been granted for a very simple piece of mechanism, which avoids all difficulty, and which is said to answer a very good purpose.

It has long since been desired to manufacture lead shot by machinery—whether by pressure, or by first casting and then pressing—to obtain the greatest amount of specific gravity; and, for this purpose, many machines have been invented and essayed—most of them without success; but this desirable object has at last been accomplished, and now shot and balls are made with great expedition by machinery with a beautifully finished surface. This, however, was not accomplished until after many unsuccessful attempts.

As to the manufacture of gunpowder, not a single patent has been granted on this subject since the year 1820.

Whilst fire-arms and other implements of war have been making slow progress, every branch of the mechanic arts, employed in their manufacture, have made very rapid strides; and now nearly every part of a gun is the product of labor saving machinery. The wood for the stock is, by a saw-mill, cut into the rough of a stock, which, by another machine, is turned to the form required; by another, the place for the barrel cut out; and, by a series of other operations, the place for the lock, guard, &c., cut out; and so with nearly all the iron work. So perfect is the whole series of operations, that any part of one gun made for the Government, can be taken off and applied to another.

10th. MISCELLANEOUS.

I have, under the previous classes, introduced everything of importance having relation to, or connexion with any of them, and which could be considered admissible in this report; and, therefore, very little remains to be treated of under the present head.

Since the exportation of ice to the south has become an important object in the northern States, many valuable inventions have been made, and applied to use, for cutting it into blocks of the required size, lifting them from the water, and depositing them on sleds, by which they are carried to the shore, and there transferred to railroad cars, and then again discharged from the cars for shipment. By these means the blocks are cut with great expedition, and of the required sizes for stowing to advantage, and much labor saved.

The coal-trade has, for a long time, been very much in want of an effective machine to break and screen anthracite coal; and, although many attempts have, from time to time, been made, it is only of late that it has been accomplished with success. Three machines have lately been patented for this purpose, which are said not only to break the coal as well as it can be done by hand, but with much less waste. One of these machines is a modification of the machine used in England for breaking stone for macadamized roads, which consists of two iron fluted rollers; but, instead of having the rollers fluted, there are large plugs, or teeth, projecting from the surface, and at sufficient distance apart to receive a lump of coal of the required size; and, instead of having the teeth of one roller fit in between the teeth of the other, the two rollers are placed at some distance apart, and geared with cog-wheels, by which they are turned in opposite directions, and so regulated that the teeth of one correspond with the spaces of the other. Sometimes there is a third roller, of smaller diameter, placed above and between the two just described, and at a greater distance from them than the two first are from each other, for the purpose of reducing very large lumps. Another of these patents is for combining this breaking machine with a set of screens to separate the lumps from the fine coal. And the third machine consists of a large iron plate pierced with holes sufficiently large to admit lumps of the required size to pass through, or of a series of cross-bars for the same purpose. Two rollers, composed of iron wheels on shafts, traverse back and forth over this platform, and force the lumps of coal through the apertures. The large lumps are carried up by an elevator, and discharged into a hopper attached to the carriage of the rollers; and, after the coal has been broken and forced through, it is conducted to a set of screens to separate the different sizes.

My object, in the foregoing, has been to give a general idea of what has been done, within a short period, by inventors—a class of men who have lived in misery and the contempt of the world, comforted and borne up through their troubles alone by the magnitude of the benefits which they were conferring on a posterity that would appreciate their worth. A monument has recently been reared to the memory of James Watt, and the time is not far distant when greater honors will be conferred on the inventor; who will be regarded as a nobler benefactor than those whose brows are wreathed with laurels from the battle field. The spread of intelligence and the progress of reason must produce this change.

I have, in as full and ample manner as the magnitude of the subject and the limited time would permit, given a survey of the progress of inventions within the range of the classes intrusted to my charge. In doing this, I have only been able to touch the prominent features of that system of utilitarianism established by the moderns—a system as vast as the resources, and important as the temporal destinies of the human race.

I have the honor to remain, yours, very respectfully, &c.,

CHS. M. KELLER,
Examiner of Patents.

Hon. H. L. Ellsworth.

F.

Report of the First Examiner on the arts.

PART II.

Patent Office, *January* 31, 1844.

Sir: In conformity with your requisition, I have the honor to submit, herewith, a brief summary of the existing condition of those branches of the arts and sciences whose examination has been specially allotted to me. Since the commencement of my official duties, (March 16, 1842,) I have reported to you the results of my examinations upon 824 applications for patents. Of this number, 527 have been patented, in whole or in part, and the remaining 297 rejected. The fact that no appeal has been taken from any one of this large number of rejections, reflects credit upon the framers of our patent law and its prudent administration.

The subjects of applications for patents apportioned to me for examination are as follows, viz:

1st. Agriculture, including instruments and operations.

2d. Chemical processes, manufactures and compounds, including medicines, dyeing, color-making, distilling, soap and candle making, mortars, cements, &c.

3d. Calorific: comprising lamps, fire places, stoves, grates, furnaces for heating buildings, cooking apparatus, preparation of fuel, &c.

4th. Mathematical, philosophical, and optical instruments, clocks, chronometers, &c.

5th. Hydraulics and pneumatics, including water-wheels, windmills, and other implements operated on by air or water, or employed in the raising and delivery of fluids.

6th. Lever: screw and other mechanical powers, as applied to pressing, weighing, raising, and moving weights.

7th. Stone and clay manufactures, including machines for pottery, glass-making, brick-making, dressing and preparing stone, cements and other building materials.

8th. Leather, including tanning and dressing, manufacture of boots, shoes, saddlery, harness, &c.

9th. Household furniture, machines and implements for domestic purposes, including washing machines, bread and cracker machines, feather dressing, &c.

10th. Arts, (polite,) fine and ornamental, including music, painting, sculpture, engraving, books, printing, binding, jewelry, &c.

11th. Surgical and medical instruments, including trusses, dental instruments, bathing apparatus, &c.

12th. Wearing apparel, articles for the toilet, &c., including instruments for manufacturing.

AGRICULTURE.

In agriculture, the first of the above classes, the plough stands conspicuous as an instrument of general utility; and notwithstanding the antiquity of this invention, from the period when it was first used by the Greeks and Romans, it has been the subject of improvement; and since some time in the sixteenth century, it has been steadily advancing in point of economy, both as regards its construction, and the labor required for its operation. A truth too often lost sight of by inventors, and as often sadly realized by the farmer, who places implicit reliance upon the recommendations of prize

ploughs, is one which should receive especial attention, viz: that not only every kind of soil, but every section of our country possessing distinctive character, whether of surface or the condition of manual or animal labor, requires a corresponding distinctive character in the plough itself; and so far is this true and important, that, beyond a question, even steam ploughing, under certain circumstances, would be economical. This view of the case will account for the apparent enigma to many who visit the Patent Office, that there should be such a large number of patented models of an invention so simple as the plough.

A variety of plough particularly deserving of notice is the anti friction wheel plough, invented first in England in 1814, and but recently introduced here, with important modifications. The friction (or more properly anti friction) wheel is placed in the rear part of the plough, and saves the friction and wear of the sole, and also answers the purpose of steadying the plough in unskillful hands. There have also been recently several important improvements in other varieties of ploughs; such are the subsoil, the double and quadruple, and the side-hill ploughs. The subsoil plough is getting into general use in the United States, and the thorough farmer now considers it indispensable in order to complete his operations. It has proved eminently useful both in wet and dry soils—in wet soils, by draining superfluous moisture; and in dry soils, by facilitating the descent of the roots of such plants as delight in deep soils. Its efficacy also in actually improving the character and depth of soils where proper tillage has been maintained, has been abundantly proved, and perhaps nowhere more signally than in the resuscitation of the steril lands exhausted by tobacco culture in Virginia. I speak from my own observation of its wonderful utility in a neighboring county, (Fairfax,) and have the corroborating testimony of the distinguished judge of that circuit, who declared some time since that Fairfax, from being proverbially one of the poorest, was fast becoming one of the most fertile counties of Virginia; and this change has been wrought by the immigration of northern farmers, bringing with them all their agricultural enterprise and knowledge of what may be properly called the mechanics of agriculture.

Each succeeding year shows improvements in the implements of agriculture, and gradual advances towards their perfection; and should our extraordinary acquisition, surpassing those of all other nations in the *mechanics* of agriculture, attract that attention, and receive that fostering care, which they so richly merit, either by the establishment of agricultural colleges, or by some other method for diffusing a thorough knowledge of the comparative merits and proper adaptation of the great variety of labor-saving machines, incalculable advantages would result to our whole country.

Of cultivators, scarificators, &c., little need be said, as the remarks upon ploughs are, in general, applicable to these instruments.

Straw-cutters.—A considerable number of these useful instruments have been patented; but, in point of economy, little progress has been made since the introduction of the revolving knives; and this might have been anticipated, as the combination and operation of knives by machinery for purposes of shearing, &c., were well understood when chopped food for cattle came into general use. The same is also true of instruments for chopping and slicing vegetables and other articles of food.

Threshing machines, &c.—Great progress has been made of late years in threshing by machinery, and in the machines for hulling and cleaning

clover, coffee, rice, and seeds of various descriptions—more particularly in cleaning wheat from smut. A most desirable point to be yet attained is the perfect separation of garlic from wheat. An approximation to this end has been reached; but there are serious (though, perhaps, not insurmountable) obstacles in the way of its entire accomplishment. Some ingenious contrivances have been produced, founded respectively upon the differences of figure, specific gravity, and texture of the two seeds—wheat and garlic.

Several patents have been granted for garlic machines, in which the leading feature was that of passing the wheat and garlic together between elastic rollers; by which operation the garlic, being softer than the wheat, was crushed and flattened, and, being thus spread out, would not pass through the meshes of the same screen with the wheat. The entire separation from the wheat of this disagreeable companion, it is believed, is yet to be effected. A more radical, and it would seem more rational undertaking, to abate this evil, would be to study closely the habits of the plant itself, and to test thoroughly the question of its extermination by culture. Such a task would call for as much, if not more inventive genius, than the purely mechanical mode of separating the seeds, and would also present legitimate subjects for patents. The northern farmer cannot look with too much apprehension upon the inroads of this noxious weed; but this evil is a mere trifle, when compared with the encroachments of that most pestiferous plant, the cocoa grass—too well known to the western and southern planters. Whole plantations have been monopolized by this plant, and, in consequence, deserted by their occupants as useless. A number of applications for patents have been made for methods of destroying this weed, and only one has been granted; but whether this or any mode can be devised to subdue this enemy, time will show. It seems to me, however, that the only chance for success will be found in the close study of the habits of the plant, from its germ to the time of its fructification, and more particularly its mode of distribution.

Concerning the *destruction of insects*, a subject of vital interest to farmers, but little has been done. Patents have been granted, from time to time, for preventing the ravages of the wheat fly, and other species of the insect kingdom troublesome to agriculturists and orchardists—some of them efficacious, but most of them too complicated and expensive for general introduction. The failure, in most attempts of this kind, has been probably due to a want of attention to the habits of the insects in their several stages of existence, viz: the embryo or egg, the larva or grub, and the imago or fly state. This is particularly exemplified in the case of the bee moth, against which no perfect safeguard has yet been invented.

No branch, perhaps, of agricultural, or rather rural occupation, has been so much neglected in this country, as *bee culture*. Wherever it has been attempted with care, it has always proved profitable; but many who engage in this business, abandon it—for the reason that the bee is left to be its own protector against its many enemies, but more particularly against its common enemy, the bee moth. A large number of applications for patents have been made for improvements in bee-hives, most of them with reference to this very point, viz: protection against the moth; and it might be reasonably inferred, from the fact that applications are continually being made for this purpose, that no complete remedy has been devised.

From the character of many of the inventions, it is obvious that the habits of this insect are not studied; and it is to be regretted that, while

naturalists and apiarians have so long investigated and made themselves familiar with the domestic habits and whole economy of bees, they have neglected to notice this their predatory, and ultimately fatal, enemy. In Virginia, it is a common practice to put the hives upon the ground, as a security from the moth; and I can testify to the fact, that bees in well made hives, protected by a covering from rain and excessive heat, under these circumstances thrive well. The eggs of the bee-moth are deposited usually somewhere about the base of the hive, and, after hatching, the larvæ crawl into the hive and commence their work of destruction. It is presumed that the instinct of the insect leads it to deposite its eggs in dry and warm places, and consequently to avoid the ground. The hive is placed upon tiles or bricks, to prevent the approach of mice, &c.

The bee readily adapts itself to every climate; and although its period for labor is abridged in the more northern latitudes, yet it seems to thrive equally well wherever it can find an abundance of food. An esteemed friend (H. K. Oliver, esq., of Salem, Massachusetts) has been singularly successful in this culture. I have not space for a detail of his peculiar mode of management, were such proper for this report; but I may state its result. This gentleman, the care of whose apiary is merely a relaxation from graver pursuits, has taken 300 pounds of honey per annum from three hives; and the average for each of his hives, for several years past, has not been less than 80 pounds. In 1840 he took from one hive 140 pounds, and left 60 pounds for the bees to winter upon. It is obvious that such continued success cannot be merely fortuitous, but must be the result of proper care and contrivance. As the importance of this culture is underrated, or, more properly speaking, but little known, I may be thought to have bestowed more attention to the subject than it deserves. Among the articles, however, which go to swell the aggregate of the annual exports of our country, beeswax forms no inconsiderable item at this time, and is capable of being very largely extended. By reference to document No. 220, of the House of Representatives, (Commerce and Navigation, 1843,) it will be seen that the amount of wax exported the preceding year was 331,856 pounds, valued at $103,626. The places to which it was chiefly sent were England, France, Sicily, Venezuela, and Chili.

CHEMISTRY.

The application of chemistry to the arts, presents a vast variety of patentable subjects, and a most fruitful field for inventors. The subjects connected with this branch, which have specially come under my examination, are chiefly the separation of elain and stearin, medicines, oil purifying, paints, or fire and water proof compositions, materials for making paper, salt and sugar making, and tanning.

The progress in this branch, so far as may be inferred from the records of the office, has been slower than might have been expected, considering the rapid advancement of chemistry within a few years past. The proverbial ingenuity of our countrymen, their readiness and tact in availing themselves of scientific discoveries, in turning directly to practical account the investigations of philosophers, have failed to sustain their reputation in chemical science, when viewed in comparison with numerous improvements made abroad, more especially in England. In fact, we have, as a community, been highly favored in the donation (if I may so express it) of

some of the most interesting and useful arts from France and England. Such, for instance, are the arts of daguerreotyping, photography as practised upon paper, &c., gilding, silvering, platinizing, zincing, and applying other metals by galvanism—all of which, in their normal conditions, and with a vast variety of useful modifications, have passed to the American public as common property. The credit is given to Professor Draper, of New York, of introducing those sensitive materials, whereby the daguerreotype art was so greatly improved; but this, we believe, is a single exception—the only case in which we have the honor of participating in the advancement of the last-named arts. Several patents have been granted for inventions relating to the art of photography, but for modifications which have not gone into general use.

The separation of the proximate constituents of lard and other oils is a subject of considerable interest, and is assuming great importance in the western portion of our country. These substances (namely, elain and stearin) are separated by a variety of processes, among which are the congelation of oil by cold, and subsequent pressure; another, pressure alone in bags, or other proper receptacles, which are of such texture as to permit the fluid elain to flow out, while the solid particles of stearin are retained; another, in which the separation is effected by the use of alcohol, in large quantities—the alcohol acting chiefly by virtue of its solvent power; and lastly, separating them by the action of long-continued boiling, with the presence of alcohol in comparatively small quantities. The former action of the alcohol is termed its analytical power; the latter, its catalytical. The elain from lard, termed lard oil, has become an article of commercial interest, and is exported largely for manufacturing and other purposes.

For combustion in lamps, the lard oil now in most of our markets is an inferior article, giving out much smoke, and encrusting the wick. The stearin, when pure, makes a candle little inferior to the best of sperm.

Castor oil has also been treated with acids, for the purpose of obtaining the stearin; and the candles made from this substance have a firm texture, and burn well; but, unless they can be divested of the peculiar odor of the oil, they cannot come into use. In the clarification of animal oils, considerable advances have been made; but the entire separation of the albumen and gelatin by any economical process, seems to be a point yet to be gained. Connected with this subject, is the production of gas for the purposes of illumination; and, from the decided superiority of oil gas over that of coal gas, and the low price of lard, we have every reason to believe that, under certain circumstances, the experiment will be perfectly successful.

From the most accurate investigations by chemists, the illuminating power of oil gas, compared with coal gas, is about as 4 to 1, bulk for bulk. The relative cost for the same quantity of light has been estimated in England to be 6 for oil gas to 1 of coal gas; and the relative cost for oil itself, and coal gas, by some as 5 to 3, and by others as 14.3 to 4.76. According to statements which can be relied upon respecting some recent experiments in the western country, seventy-six gas burners, of great illuminating power, burning four hours per day, required a consumption of 45 pounds of lard, (of the worst quality, answering equally as well as the best,) costing $1 35, or 3 cents per pound. This is about equal to 5½ gallons of oil; and, as 1 gallon of oil will make 100 cubic feet of gas, the 5½ gallons will make over 500 feet, which is equivalent to about 1,500 cubic feet of coal gas. The data upon this subject are not sufficiently full to

warrant an unqualified opinion upon the subject; but high hopes are entertained, by many, of ultimate success.

Medicines.—Notwithstanding the imputation of empiricism which invariably attaches itself to patented medicines, some very valuable discoveries have been made in the healing art; and although the question of utility does not, as a general thing, come under the consideration of the office, yet, to prevent injury and imposition, it becomes necessary, to a certain extent, in cases of patent medicines, to call for tests of their efficacy. In several cases their value has been proved by direct experiments; and in others, testimonials of the most creditable character have been received, vouching for their genuineness. In this science, as well as in chemical, many of the most valuable discoveries have been made abroad—such as the use of chloride of soda as an enema in hemorrhoidal affections; the immediate relief from that most painful of diseases, tic doloureux, by the simple topical application of ammonia; and the allaying, in the most speedy and effectual manner, the paroxysms of delirium tremens, by the use of carbonate of ammonia; and numerous others, which might be cited.

Surgery may be considered a separate class for examination. By far the greatest number of patents in surgery have been obtained for trusses and abdominal supporters. A most singular and interesting method has been resorted to, for dissolving and removing calculi from the bladder by galvanic agency; thus saving the patient the pain and peril of lithotomy. Under the same application is represented the transfusion of remedial substances through the body by galvanism, for the cure of a variety of diseases, saving the necessity of taking medicines into the stomach. These modes of treatment have, we are informed, been recently introduced into the London hospitals with great success.

A number of applications have been made for alleged improvements in the coating of metals by galvanism; but all of them rejected, as having been anticipated abroad.

A considerable number of patents have been hitherto granted for electro-magnetic engines; but, for the last two years, this science has received but little attention in this country, while it has been the subject of constant and some very extensive experiments in Europe.

Some time in the last year, a trial of an electro-magnetic engine was made on the Edinburgh and Glasgow railroad, which resulted in propelling a locomotive at the rate of four miles per hour. The weight of the locomotive (consisting of the carriage, electro-magnetic machine, and galvanic battery) was six tons. The principle of electro-motion, and the plan of the engine, were the same as had been adopted in this country more than three years before; as was also the case with an engine exhibited by Captain Taylor in London, which gained some repute.

Professor Henry, of Princeton, New Jersey, was the first inventor of the electro-magnetic engine, and may be justly considered the founder of this branch of the science.

Scientific men, and the public in general, have but little confidence in the application of this power; but, to one familiar with the subject, I think it must appear that the day is not far distant when electro-magnetic power will be substituted in a variety of cases for the dangerous agency of steam. The great strides in the improvement of the galvanic battery recently made in Europe encourage this belief, independent of the interesting discoveries almost daily announced in relation to the phenomena of electro-motion.

The galvanic battery, the source of electro-motive power, has undergone such vast changes since the year when Professor Henry produced his invention, that a single square *inch* of zinc will now develop an attractive power greater than could be then obtained by one square *foot*. If upon such a ratio of improvement as this, (viz: 144 to 1,) we cannot venture to predicate the final triumph of this power, then was Fulton, in his day, justly looked upon as chimerical and visionary. I may add here, that there is deposited in this building an electro-magnet, which, when fully charged, will sustain a weight of about ten tons. The recent interesting discoveries by Professor Morse (whose telegraph is to have especial notice in your report) will have a direct bearing upon this subject. The first of these presents a most astonishing fact, that two galvanic currents may be passed in the same wire, in opposite directions, without interference with their respective functions; and, secondly, the verification, by actual experiment, upon a magnificent scale, of Ohm's law concerning the resistance upon galvanic currents through extended circuits; the result of which proved that, up to a certain distance, the current underwent rapid diminution; beyond which point, the decrement of power became too small to be appreciable—and this, through any additional length of circuit. Galvanism, in its various applications, is destined soon to become one of the most useful agents to mankind. Witness the already numerous and diversified uses of this agent in the arts. An individual having occasion to use some wire gauze, which could not be readily obtained, resorted to the deposite of gold upon some common lace or coarse muslin by galvanism; the result was a beautiful gold lace, unequalled and inimitable by any mechanical process. Similar in character to this (in a measure) fortuitous discovery, was the production of the golden fleece, by galvanism, in a course of experiments by a young man in Sweden; for which interesting discovery he was persecuted by the populace as a dealer in the black art, compelled to leave his country, and took refuge in Germany.

Electro-tinting, or printing in colors by means of galvanism, exhibits an interesting application of this agent, and one which may be of much value. The process is applied to printing upon paper in various colors, and more particularly to calico printing. The chemical substances producing the required colors are made to act upon the paper or cloth placed between two plates of metal acting as a galvanic pair; and, in this way, in fact, both sides of the cloth may be printed at one operation, and each in different colors.

The art of electrotyping offers much of interest to the man of science, and more of value to the artist. To the numismatist it is invaluable, as it affords him the means of multiplying, in the most accurate manner, copies of valuable coins; and this with great facility. Seals, medals, inscriptions, busts, statuary, and almost all kinds of ornamental work, have been copied with a fidelity beyond the power of man's hand to approach. To the engraver its tribute is two-fold, ten-fold, manifold. After the wearisome toil of months, perhaps years, in engraving his copper-plate, he can, in two or three days at the farthest, have one, two, three, or almost any number of engraved plates perfect fac-similes; yes, even more than fac-similes—engraved plates, which will produce better impressions than the original plate. However paradoxical it may appear, it is nevertheless true, that electrotype copies of engraved plates produce clearer and brighter impressions than the originals. Several specimens now in this office afford full

proof of this fact. The *rationale* of this singular result will doubtless be found in the superior texture of the copper deposited by electrical action.

The several modes of electrotyping engraved plates are—first, making a copy in relief upon a clean lead plate, by great pressure; immediately after which, the lead plate is immersed in a solution of the sulphate of copper, and rendered electro negative by communication with a galvanic battery; the galvanic action decomposing the sulphate, the copper is deposited, in its pure metallic form, upon every part of the lead plate. When the deposite of copper is of sufficient thickness, the two plates are removed from the solution, quickly dried, and, by the application of moderate heat, the unequal expansion of the two metals causes them to separate; and, if the impression upon the lead plate was perfect, the new copperplate exhibits a copy of the original plate perfectly accurate in its minutest details. A second process is to obtain, in relief, a casting of fusible metal; and this casting is submitted to the same galvanic operation as the lead plate in the first named process, and is finally removed from the upper deposite by melting. A third method of electrotyping engraved plates, is to make the engraved plate itself receive the deposite; the copy thus obtained, in relief, is deposited upon as before, and the proper intaglio impression is thus obtained to be printed from. It will be evident, that by the two first-mentioned operations, any number of copies in lead or fusible metal may be obtained, and all submitted at once to the electrical deposite, which is generally completed in two days. So wonderfully delicate and faithful is this mode of copying, that even that unrivalled work of nature's own engraving, the daguerreotype impression, may be copied by the electrotype in the most beautiful manner. The picture upon the surface of the copper deposite has even more beauty than the original upon the silver plate, from the richness of the ground tint. The specimen submitted to this office some time since, exhibited a perfect copy of the daguerreotype picture, which last was also exhibited in an uninjured state. As the daguerreotype impression is the reverse of nature, the electrotype impression being the reverse of the former, presents the picture in its proper view. The most remarkable fact in this connexion, is, that the electrotype picture preserves all the tints and demi-tints of the original. It was long since discovered that the surface of polished steel might be made to exhibit the appearance of the mother of-pearl, by very finely striating its surface, in actual imitation of the surface of the mother-of pearl; but here is a most interesting exemplification of the difference of action of particles of the same metal upon light. The color of copper is usually recognised as red; but the copper picture exhibits red, black, brown, perfect blue, and perfect white—each of them corresponding to the colors of the original, and all depending upon the arrangement of the particles constituting the surface of the copperplate.

The electrotype art does even more than to enable the engraver to multiply his plates; it actually assists him in engraving. This process is the reverse of the former. The prepared copperplate, with a drawing upon it, is made the electro-positive plate in connexion with a galvanic battery, and, being immersed in acid, the parts uncovered by the drawing are etched in the most beautiful manner. To such perfection has this branch of the art been carried, that even the daguerreotype impression has been etched; and from this gossamer work of nature's pencil, produced in a few seconds, a permanent engraved plate is made, capable of printing a great number of pictures. Truly this is *drawing* by light, and *engraving* by electricity.

Galvanism has been used successfully for blasting rocks in such a way as to insure the safety of the workmen, and also enabling them to make any number of blasts at the same instant. A wire completing the circuit of the battery, which may be at any desired distance, passes through the train of every charge; a piece of platina wire in contact with the powder, being interposed in the circuit, becomes red hot the moment the battery circuit is completed, and ignites the powder. The same principle of blasting has been applied under water, to raise the sunken wrecks of vessels obstructing navigation, and is also to be used by the Government of the United States for the defence of harbors. Galvanism has also been used for the manufacture of artificial gems, and very successfully applied to the reduction of gold and silver from ores, and for obtaining large masses of platinum. A piece of gold weighing $\frac{7}{10}$ of a pound, obtained by what is termed the galvano-plastic process, was not long since presented by Professor Jacobi to the King of Prussia.

A most novel and interesting application of galvanism is in the formation of what is called the electro metallic hortus siccus. The exact form, and all the external characters of leaves, fruits, &c., are made and preserved in metallic copper. The leaf, or other specimen to be preserved, is coated by means of a soft brush, with fine plumbago, and then submitted to the electrotype process in sulphate of copper, as before described. The copper, thus deposited upon the specimen, takes its precise form, and thus preserves in metal all the external characteristics of the plant or fruit.

Another extraordinary use of galvanism is the transfusion of remedial substances through the body—the same process mentioned under the head of "surgery." If it is desired, for instance, to impregnate the system, or any part of the system, with iodine, a cataplasm of iodine is prepared, or rather of some salt containing iodine, (such as the hydriodate of potash,) and placed upon any part of the body, remote from the seat of the disease, for which in this case we suppose iodine to be the remedy. Near the seat of the disease, a moistened sheet of tin foil is brought in contact with the skin, and, by establishing a proper electro-chemical relation between the iodized cataplasm and the sheet of tin foil, the iodine is immediately transfused, and may be arrested in considerable quantity in the diseased part. So certain and speedy is this transfusion, that if a person place the finger of one hand in a solution of starch connected with the positive pole of a galvanic battery, and a finger of the other hand in a solution of hydriodate of potash connected with the negative pole, in a short time the iodine from the decomposition of the hydriodate will pass through from one hand to the other, which is indicated at once by the blue color produced in the starch.

In a practical point of view, one of the most interesting subjects of inquiry connected with galvanism is the protection of metals from corrosion—more particularly copper and iron—from the extensive use of the former in the sheathing of vessels, and of the latter in their construction, as a substitute for timber. We are indebted to Sir Humphrey Davy for the first suggestions respecting the preservation of copper sheathing by galvanic agency; and although his proposed plans have not been found to answer in practice, yet the conception was nevertheless beautiful and ingenious; and should any certain remedy be devised to prevent this evil, it will be found to have grown out of Davy's proposition. From the onward progress of galvanism, we have strong reasons to believe that means will be devised to render copper and other of the baser metals as indestructible as

gold or platinum. Take zinc, for instance, as an example of what has been done in this respect. If a piece of the ordinary zinc of commerce is immersed in diluted sulphuric acid, rapid decomposition takes place, and the zinc is soon converted into white vitriol, or the sulphate of zinc. It has been found—and a most important discovery it has proved—that if the surface of the zinc is amalgamated, by rubbing it over with mercury, it may remain in the acid solution for a great length of time without action. The instant the zinc is touched with another metal, rapid action commences, which also ceases the instant the other metal is withdrawn. From this curious and valuable fact, and from what we shall presently relate of the peculiar properties of iron, it does not seem among the impossibilities that copper and iron may yet be rendered inoxidable.

It has recently been stated before the British Association, that the rapid corrosion of some copper sheathing is due to some peculiar quality of the copper itself. The corrosion of iron by sea and fresh water is now a matter of extensive experiment and study, from the growing importance of this metal as a material for ship-building. Sufficient time has not yet elapsed, since its first introduction, to test its entire value; and there is much discrepancy in the accounts given of the action of sea and river water upon iron.

The same remark here applies to iron, which was made in regard to copper, viz: that different qualities of iron behave very differently under the same circumstances. According to some statements, it appears that the oxidation of iron in sea water is so slight as to furnish no objection to its use for ship-building; while, at the same time, it must be admitted that the warrantable apprehension on this point has given rise to a great deal of discussion and investigation. Some singular facts have recently been brought to light, in regard to the long-continued action of sea water upon cast iron. Iron that has been thus exposed, when brought into the air, becomes red-hot, and generally falls to pieces. This was the case with some cannon balls raised from the ship Mary Rose, which sunk in a naval engagement near the Isle of Wight in the year 1545, nearly 300 years prior to the time of raising them. In most cases of this kind, the iron has been found in a state resembling the carburet of this metal. In its electro-chemical relations, iron presents to the chemist more perplexing anomalies and mysteries than any other metal. For instance: iron, which is strongly electro-positive with regard to copper, is as strongly electro negative with regard to zinc, as copper itself. Faraday has shown that iron (a metal generally so easily oxidized) may remain, under peculiar conditions, even for months, in strong nitric acid, without undergoing the least change. In some cases, the mere touching the iron for a moment with platinum rendered it proof against the attack of this powerful acid. The celebrated Professor Schonbein has also recently shown that, under peculiar conditions, iron may be either the least oxidable, or the most oxidable, of all the metals. From the foregoing, it will appear that much is yet to be learned respecting the nature of this abundant and useful metal; and with what little we know of it at present, we are inclined to admit the truth of Mr. Fairbairn's prediction, made before the British Association about three years since—that iron would, ere long, supersede wood in ship-building. One circumstance worthy of note here, respecting the rusting of iron, is this: that iron which is constantly worked, does not rust like iron in a state of rest. Mr. Stephenson, an engineer, has recently paid much attention to

the subject, and alludes to a fact, (which doubtless many have observed,) that, upon railroads, the rails which are worked do not rust, while rails laid alongside these, and not worked, rust in a short time. Mr. Stephenson supposes that electricity is developed during the passage of the cars, and this prevents the rust. But this is hypothesis, without application or explanation; for electricity might cause rust, or prevent it, according to circumstances. The real cause I suppose to be this: The rusting of iron is a true electro-chemical result. All such results seem to imply, or even require, a previous condition or relation termed electro-polarization. I have frequently found that this kind of polarization is interfered with by motion or agitation, and is favored by a state of rest. It seems most likely that the constant agitation of the rails prevents their assuming this condition, and that this, in connexion with the purely mechanical effect of shaking off what oxide might form upon the rails, would account for this curious fact.

Salt making.—The vast resources of the United States for the manufacture of salt, render the prosecution of this subject one of great general interest, and high promise to inventors. The only recent remarkable changes in salt-works are the introduction of tubular evaporators, and the use of hollow grate bars for heating the brine.

Sugar making.—The most important recent improvements connected with this subject have been made in the refining and crystalizing of sugar. The specimens of cane, beet, and corn sugar, exhibited in this office, show a high degree of perfection in this art. Attention has recently been drawn to the economy of fuel in making sugar from the cane, a subject of great importance to the southern planters; and it is a little singular that they have not, long ere this, availed themselves of the improvements made in Europe, chiefly in France and England.

A patent, however, has recently been granted, embracing a number of novelties, for what appears to be a highly important invention, which, if it should succeed, will entirely revolutionize the present mode of making sugar in the south. The chemical characters of different kinds of sugar are at the present day much studied, and some curious facts concerning them have been brought to light. It is well known that some kinds of sugar crystalize with ease, while others cannot be crystalized at all. Analysis has detected a slight difference in their atomic constitution, which would account for this singular disagreement in their crystalizing power. Of the crystalizable class are the cane, corn, beet, and maple sugar. Uncrystalizable sugar is frequently termed the grape sugar, as it exists ready formed in the juice of ripe grapes; of this class are sugars made from starch, whether by the action of diastase or sulphuric acid, and sugar from linen rags, or sawdust and gluten. The formation of sugar, from the action of diastase upon starch, presents a curious phenomenon, but cannot be considered of practical value, although this idea has been entertained by some.

Diastase is extracted by water from malt, and possesses the remarkable property of converting starch into sugar in a few hours, and, in some cases, in a few minutes. One hundred parts of starch, made into a paste with thirty nine times their weight of water, mixed with six parts of diastase, dissolved in forty parts water, and kept for one hour between 140° and 149° Fahrenheit, afford eighty parts of sugar.

Fusion of metals, &c.—A mode of welding copper has lately been the subject of a patent, which must prove of value in many cases, as the pres-

ervation of uniformity in the metal precludes all electro-chemical effect, which always occurs in the soldering of metals.

A mode of fusing platinum in large quantities has been recently patented; an invention of much interest and value. Platinum resists the highest heat of furnaces, but, by an ingenious arrangement and improvement of the oxi-hydrogen blow-pipe, it can now be fused in considerable quantity. Another useful application of this instrument, at the present day, is in the formation of artificial gems, in imitation of precious stones. Truly, in this case does nature acknowledge the rivalship of art. The chemical philosopher arrives at the exact composition of the gem by analysis; the artist, availing himself of the intense heat of the compound blow-pipe, and the knowledge of the chemist, selects the elements of the gem, re-combines them, and actually reproduces one of nature's most beautiful and valuable works.

Mathematical instruments, &c.—Frequent and important improvements are made in this class of inventions, but comparatively few come under the cognizance of the office, owing to the limited use of such instruments. Some patents have been granted for improvements in surveying instruments, greatly facilitating their use.

A patent has been recently granted for a novel arrangement of the globe and celestial sphere, designed for purposes of instruction; and also for a new form of sun-dial, called the hemispherical sun-dial; the gnomon fixed in, and rising from, the centre of a hemispherical cup, the shadow falling upon its graduated interior surface.

FINE ARTS.

Printing.—Justly characterized as the most important of human inventions, this art is steadily advancing in the track of improvement. One of the most important eras in the history of the press, is that of the introduction of cylinder pressing, aided by steam-power, which was first tested in 1814 in printing the "London Times." A new and a brighter era is, however, now in its dawn, and nowhere is what may be justly termed the intelligence of machinery better displayed, than in some of the recent improvements in type setting. Instead of selecting the types by hand, the compositor sits before an instrument with keys arranged like those of the piano-forte, and, as it were, plays out his task. The keys are lettered, and as each one is struck, a corresponding type is liberated from its receptacle, carried upon an endless belt to what is termed the composing or justifying stick, placed there in its proper position, and, as soon as the composing stick is full, which completes a line, notice is given to the compositor by the ringing of a bell, and he then waits for the removal and replacement of the stick.

The first improvement of this description was calculated to set from 12,000 to 15,000 letters in one hour, working about six times as fast as an ordinary compositor can by hand.

Another invention, subsequent to this last, involving several improvements, embraces not only the composing of types, but actually performs the distribution of types in a rapid manner. After the types have been used they must be distributed; and, by an exceedingly ingenious process this has been effected by machinery. The types are removed from the form, line by line, and, as the distributor reads the line, he touches keys corresponding to each letter, which, through a certain combination of machinery,

carries each type to its appropriate receptacle. A boy, by the aid of this machine, can distribute and replace in the composing machine 6,000 letters in the hour.

Glass.—In the manufacture of this material, as well as in its subsequent working, important improvements have been made. The coloring of glass, and the production of works in painted glass, have advanced to a high state of perfection. The popular error of considering the ancient art of glass painting to be completely lost, has been exploded. The truth is, that this art at the present day exhibits a higher condition of improvement than at any former period, although the contrary opinion generally prevails. It has been found, by careful experiment, that, when the metals themselves, instead of their oxides, have been fused with glass, it presents that dull, untransparent appearance, which is remarkably characteristic of ancient stained glass, and, by repeated analytical and synthetical trials, the composition of ancient glass has been fully determined. The investigation of this subject has proceeded so far, that nearly all the colors used by the artist of the middle ages for painting on glass have been determined with accuracy.

A most interesting application of glass has been made within two or three years, in the formation of ornamental damasks, by weaving glass threads with silk. They are richer in appearance, and cost less, than the gold or silver damasks. Such improvements have been made in the process of annealing the glass, that the threads are rendered almost as pliable as silk itself.

In the manufacture of glass, a plan has recently been adopted by which it is freed from air bubbles—a consideration of great consequence in the preparation of glass for optical purposes. A vacuum is created over the melted glass, causing the air bubbles to expand and rise more readily to the surface.

Among the trophies of the art of glass making, may be instanced here the enormous sheet of plate glass lately cast by the Thames Plate-Glass Company. Its dimensions are 14 feet 8 inches in length, and 8½ feet in width. An ingenious process for making concave glass mirrors was not long since introduced, though it involves practical objections to its common use. A large, thin, and uniform glass mirror was firmly cemented to an iron rim, and, by means of an air-pump, a vacuum was created under the plate of glass, and the pressure of the atmosphere produced a concavity of the glass in proportion to the exhaustion beneath. The curve of the mirror obtained in this way cannot be very deep, and forms what is termed the catenary curve.

Extensive improvements have been lately introduced in the modes of flattening and annealing window-glass. It will be understood that the plate-glass is cast in a mould, and undergoes a subsequent laborious process of grinding and polishing. The window-glass is made by blowing the glass into immense wheels, and cutting these into pieces of suitable size, or by blowing the glass into thin cylinders, which, being divided throughout their length, are placed upon smooth stones in a heated oven. These cylinders are laid or spread down upon the stones by the paddles of the workmen; and formerly there was much risk and labor in transferring these plates from one stone to another, and carrying them to the annealing oven. All these operations are performed now with great facility, by means of immense revolving tables placed within the oven, and connected with other tables, or carriages, for transferring them to the annealing oven; or, as in another mode, by having the axis of the revolving table between the flattening and

cooling or annealing oven, so that the same table, in revolving, takes the plates successively from the first to the second oven.

Stone and clay manufactures, &c.—In the preparation of clay, and moulding and pressing of bricks, great improvements have been made, and some of the recent inventions present very interesting instances of the performance, in sequence of a variety of operations in one combined machine, where, formerly, each operation required the use of hand labor, or a distinct machine. The grinding, sifting, and tempering of the clay, its transference to the moulds, and pressing, are all effected in quick routine, in one combination of machinery. The dry pressing of bricks is an important invention, and produces more beautiful specimens of bricks than can be obtained by any of the old modes, where the bricks are pressed in a wet state, as the escape of the water during the baking causes the bricks to warp and crack. In the dry process, the clay is very finely levigated, and, in this state, is submitted to a pressure far greater than that required by the wet brick. The pressure brings the particles into close contact—forming a solid coherent mass, easily handled and transferred to the kiln. A practice not so so much resorted to in this country as in England for facilitating the baking of brick, is that of mixing fine coal dust with the clay. The coal-dust becomes ignited during the baking, and lends the aid of its own heat. It makes a saving of fuel; while the bricks, it is alleged, are firm and compact.

Materials for making paper.—The handmaid of the noble art of printing is that of paper-making, and presents in its modern history a series of advancements fraught with interest and value. This remark applies chiefly, however, to the machinery for paper-making, although much has been done in the preparation of materials for this purpose; which latter branch of the art is assigned to me for examination. Almost every known vegetable fibre has been the subject of experiment, with a view to obtain some substitute for rags. According to the statistical returns collected in the taking of the last census, it appears that the consumption of paper rags in the United States amounts annually to the sum of six millions of dollars. By reference, also, to a valuable document heretofore alluded to in this report, (Commerce and Navigation, No. 220, House of Representatives, 1843,) it appears that the total value of importation of rags in 1842 amounted to $468,220, brought chiefly from Trieste and other Austrian Adriatic ports, and the Hanse towns.

The willow, and a variety of trees of a similar character, the pulp of the beet-root, the fibres of many exotic plants, of corn-husks, straw, and several other vegetable fibres, have been manufactured into paper; but none of these have come into general use in this country.

A patent has recently been granted for making paper from the Manilla hemp, (the fibre of the wild plantain of Asia,) and, judging from the specimens sent to this office, it affords an uncommonly strong and fine wrapping paper. Unsuccessful attempts have been hitherto made in England, and elsewhere, to make paper from this fibre; but, by the improved process described in this patent for reducing the fibre, a paper is made exceeding in strength any paper before known.

Another invention, which will without doubt shortly arrest the public attention, is a mode of reducing the fibre, and applying to several useful purposes almost the entire substance of the common cane, (the *arundo gigantea* of botanists,) a plant covering immense fields, known under the

name of cane-brakes in the southern sections of the United States. This invention, for which a patent has been granted, professes to reduce this plant (hitherto but an incumbrance upon vast fertile tracts of land) to two distinct conditions, viz: first, a species of partially prepared hemp, designated as cane hemp; and, second, to a pulp for making paper; which last appears to have been the chief object in view with the inventor. Samples of the cane in the various stages of its manufacture were submitted to the office, together with the results of experiments, in the form of hemp, of the pulp, of the paper into which the pulp is converted, both bleached and unbleached, and of twine or cordage—all the production, as stated, of the cane; for which we have hardly found any use, other than to make fishing-rods. These seem to stamp the invention with a practical character, and lead us to believe that it may be of great value to the country at large, and of no little value to that part of the country where this plant is indigenous. The samples of paper exhibited, though merely made by the old manual process, are of a firm texture and even surface, possessing apparently all the qualities of a linen paper, and also the remarkable quality of receiving ink without the previous preparation of sizing. The inventor estimates that he may be able to reduce the cane into hemp, put it into bales, and ship it to New York, at a cost not exceeding one cent per pound, or one dollar a hundred. If in this estimate he does not deceive himself, or much overrate his business, it is easy to see that this invention is entitled to be classed with the most valuable improvements of the age. It professes to act upon a substance, inexhaustible, abundant, and, so far, almost worthless; and at a slight expense, converts it into a material of vital importance, and applicable to a vast variety of purposes. Paper has long since been made from the cane, and the common paper of the East Indies is of this description. The inventor takes no credit to himself, except for his peculiar modes of treating the cane, so as to render the process economical in this country.

Several patents have been granted for improvements in friction matches; and one very important change has been made in this article, by which the noxious fumes of sulphurous acid gas are avoided. The detonating composition is made as usual, and the match is dipped in melted wax instead of sulphur.

In water-proofing compositions, considerable progress has been made in the last two years. It is a very easy matter to render cloth water-proof; but to render cloth water proof, and at the same time permeable to air, seems a difficult task. This has been done. The water-proof clothing formerly made was attended with a serious evil, as, while it kept moisture out, it kept moisture in, and prevented access of air to the skin. A specimen of water-proof fabric was fairly tested in this office during the last year. A piece of the cloth was stretched over a frame so as to hold a considerable quantity of water, and it was kept filled with water for several months, not a drop of which passed through the cloth, and the cloth itself had not become wetted by contact with the water.

The curing of smoky chimneys, a subject seemingly presenting little difficulty, is yet problematical, and, so important has it become, that it is repeatedly brought up before the British Association and other learned societies of Europe. In England, attention has been chiefly directed to the construction of the chimney itself, and the proper arrangement, proportion, and interior finish of flues; while, in the United States, the remedy has

been sought for by a different route. The subject of ventilators, or chimney caps, has been very closely investigated; a vast number of experiments tried; and it is believed that some of the most approved forms of chimney caps afford a certain cure for the evil.

The basis of the most useful forms of chimney caps is an old German invention, which is little inferior to the present modifications. Although this invention is highly useful in the present state of our knowledge on this subject, yet, from their unsightly appearance and disfigurement of architectural beauty, it is to be hoped they will in time be superseded by inventions of a more radical nature. It would be better (and it should not be despaired of) to prevent the evil altogether, than to suffer it to exist, and then resort to the application of remedies.

Spark-arresters.—The annoyance to passengers upon railroads, produced by unconsumed particles of coal or wood, and also by dead sparks, (as they are called,) has been, to a great degree, prevented by these instruments; but there remain yet some defects in the operation of spark-arresters to be supplied by inventive genius.

HYDRAULICS.

Water-wheels.—No one class of inventions (with the exception, perhaps, of stoves) exhibits such a medley of utility and absurdity as the water-wheel. It is probable that, since the origin of the Patent Office, there have been more applications for patents for this description of machines than any other in the whole routine of useful arts. In regard to water privileges, this country is highly favored; and this, one would naturally suppose, would lead to the careful study of water-wheels; but the contrary is true, if we are to infer from the character of a large number of these inventions presented for our examination. The re-action wheel is at present, and has for some time been, the favorite, and has been submitted to the most singular contortions, to extort from it the full performance of its duty. So ill-directed have been many of the efforts to improve this instrument, that several applications have been rejected upon the ground that the invention was 200, and even 300 years old.

A species of hobby (if I may so term it—a fallacy as universal as that of perpetual motion) has possessed the minds of the majority pursuing this invention. It is this: that the water failing to exert its whole power upon the floats or buckets of the wheel, should be made then to act upon a new series of buckets, or even upon a secondary wheel—losing sight of the established and only principle of economy, that the wheel and buckets should be so proportioned to the size and height of the fall of water, as that the water should be delivered powerless from the wheel.

The most simple form of the re-action wheel, is the one well known as Barker's water-mill, which is the basis of the now celebrated turbine, exciting so much attention in Europe. This invention is the result of close study, and its theory is considered by the ablest judges as perfect. According to the statements of Professor Gordon, its advantages are—

"1st. That it is with like advantage applicable to every height of fall, expending quantities of water proportional to the square roots of the height of the fall, the angular velocity being likewise proportional to these square roots.

"2d. That its net efficiency is from seventy to seventy five per cent. The greatest efficiency of Barker's mill has never reached fifty per cent.

"3d. That it may work at velocities much above or below that corresponding to the maximum of useful effect—the useful effect varying very little from the maximum nevertheless; and,

"4th. It works at considerable depths under water; the relation of the useful effect produced, to the total mechanical effect expended, not being thereby notably diminished. The mean results appear to be, that the height of the fall being 6 feet 6 inches, when the expenditure of the water is 35 cubic feet per second, its efficacy is— = 0.71

63	cubic feet	= 0.75
79	"	= 0.87
126	"	= 0.81
144	"	= 0.80"

These are the results of experiments made upon a single wheel which was purposely constructed to deliver, with the above height of fall, seventy-nine cubic feet of water per second, which, by reference to the above table, gives the maximum of power. The results are rendered certain by the application of a dynamometer to the shaft of the turbine itself. The turbine has been thoroughly investigated by Arago and M. Poncelet; and, according to the report of the French academicians, the whole secret of this instrument lies in constructing the curves, and laying out the angles in which the water from the drum shall issue into the canals of the Turbine, so as to enter without shock, and leave them without velocity. One of the new turbines of Fourneyron, described in the London Literary Gazette, makes from two thousand two hundred to two thousand three hundred revolutions per minute, and is of fifty eight horse power.

Hydrants or stop cocks.—The recent introduction of the Croton water in New York has drawn attention to the construction of these instruments, and developed some important improvements in connexion with this subject. The hydrant has been much simplified, and all danger from freezing entirely avoided, by ingenious contrivances for letting off all the water in the hydrant to a certain depth below the surface of the ground.

Ingenious provisions have also been made to prevent the bursting of water pipes, frequently occasioned by the too sudden checking of the momentum of the water, consisting mainly in receiving the shock of the water upon elastic materials placed in suitable receptacles connected with the pipes. The important discovery is also alleged to have been made of a material for coating the interior of iron pipes conveying water, which is said to be durable, easy of application, and imparting no flavor to the water.

The introduction of glass pipes has recently been made in France; and although the plan is so novel, and apparently expensive in the outset, yet there can be little doubt of its ultimate economy. It has been ascertained by chemists, that not only liquids of a corrosive character, but even water itself in its ordinary state of purity, standing in glass for a considerable length of time, will become impregnated with lead. But should the most fastidious raise any alarm on this point, they may be furnished with glass containing not a particle of lead, or any poisonous material. Although glass is strongly acted upon by sea water, and is in time decomposed under almost any circumstances, (as is the case with specimens of glass found in Italy after nearly 2,000 years exposure,) yet, we may consider it, for all practical purposes, as imperishable; for it would doubtless last for the above use many hundred years.

CALORIFIC.

Stoves.—Patented stoves far outnumber every other class of inventions in the United States; and concerning this class little need be said, as their principal features of construction have been brought home to the knowledge and understanding of every individual.

The economy of fuel is a subject of universal interest; and a very considerable advance has been made of late years in the proper regulation of combustion, both for manufacturing purposes and the common wants of life. Some ingeniously contrived cooking-stoves have been patented, in which, by the consumption of a small amount of fuel, all the varieties of cooking may be effected simultaneously. The air-tight stove has been particularly the subject of improvement; and some ingenious plans have been produced for regulating the consumption of fuel in stoves by self registering machines. By the expansion and contraction of metallic bars, the valve or door admitting the air is closed or opened, so as to control the draught, and preserve an even temperature in the apartment. The apparatus is provided with an adjustable index, which can be set so as to consume more or less fuel, as changes in the weather may require. The introduction of air heating furnaces for large apartments, public buildings, &c., has proved to be a source of comfort and luxury, and is, I understand, to be a subject of special reference in your repórt. The heating of buildings by hot water has also been tried successfully upon a grand scale; and, in addition to the economy of this invention, there is an important advantage, viz: that of regulating the heat with great precision. In consequence of this, the heating apparatus never is allowed to attain such a high temperature as to produce that disagreeable affection of head ache and langor, attendant upon the use of stoves or highly heated air. The cause of this unpleasant effect is yet a matter of doubt. The most plausible explanation is, that the fine particles of dust, &c., floating in the air, become carbonized by contact with the highly-heated iron, and the inhalation of these carbonaceous particles causes the headache, &c.

The most important improvements in the economy of fuel, and distribution of heat, have been made in reference to the construction of furnaces for metallurgic purposes, and furnaces for steam-boilers, which are not included in the class "calorific," but form separate classes of themselves.

Lamps.—The recent extensive introduction of lard for combustion in lamps, has wrought a considerable change, both in the construction of hand and argand lamps. The use of this material in the hand lamp has, in some few contrivances, proved to be more economical than sperm oil; but its peculiar advantages are to be found in its use in the new variety of argand lamp, called the solar lamp. The solar lamp was invented in England many years since, but has been adopted in this country only within the last two years. The interior draught of this lamp is the same as in the common argand or astral lamp. Its novelty consists in having a conical metallic rim placed around the wick in such a manner that nearly all the air which reaches the flame exteriorly, shall impinge upon it some distance above the point of combustion. It is well known that the flame possesses but little heat and light near the wick, and that the developed carbon does not fully combine with the oxygen of the atmosphere until it reaches a point somewhat above the wick. Between this point and the wick, the air is directed upon the flame by means of the metallic cone, usually called

the external deflector, and causes a very pure and brilliant flame. According to statements made by Dr. Fyfe, in January last, before the Scottish Society of Useful Arts, the solar lamp, compared with the common argand, makes a saving of one-half. A great advantage of this lamp is, that impure oil burns as well, and, in some cases, decidedly better than the best of sperm oil. During some investigations recently made by this office, in reference to this subject, it was rendered probable that this important invention originated in this country, although it is claimed by the English. As lard must be rendered liquid before it can be taken up with sufficient rapidity by the capillary action of the wick, a variety of methods have been resorted to for conducting the heat of the flame to that portion of the lard immediately in contact with the wick as soon as this is kindled. The sole reliance upon this plan has resulted in the failure of every lamp of this description, and for obvious reasons. If the heater, which is usually a bar of copper, rise above the wick, its shadow is an objection; if it is inserted in the flame, it exerts a refrigerating effect, and the heat conducted to the lard is at the expense of so much light; if placed above the flame, it is awkward, and collects large quantities of lampblack. In order to burn lard successfully in hand lamps, it has been found necessary to keep the surface of the lard as near as possible to the top of the wick; and several ingenious inventions have been made to answer this purpose. Of this description are the piston lamp, the spring lamp, and the self-supplying lamp. The two former require frequent personal attention; and the latter, unless very carefully constructed, will not answer at all. When lard is burned in the solar lamp, neither of the above provisions is requisite. The amount of heat conducted by the wick-tube itself, is sufficient to keep the lard fluid, and at a high temperature, so that it is readily absorbed by the wick. Two important modifications have been made in the solar lamp, to adapt it to the use of lard. The first is giving the lard freer access to the wick on both sides than could be obtained in the oil lamp; and the second, in insulating the wick tube from the body of the lamp, so as to prevent the diffusion of heat, and to conduct it where it is most needed. From fair comparisons made with the lard solar lamp, and other approved lamps, it has been found superior to all, except the celebrated French carcel lamp. The carcel lamp, in which the oil is forced upon the wick by the continued action of clock-work, gives a very intense light; but its expense is far greater than that of the lard lamp. In this place, where lard is from 6 to 10 cents per pound, and sperm oil $1 per gallon, the saving in these lamps is nearly one-third. In many portions of the United States, (the west particularly,) the saving must be much greater.

The introduction of the camphine lamp (some time prior to that of the lard lamp) was at first attended with some difficulty, owing to a number of serious accidents from the explosion of the liquid used, termed the camphine oil. They are now, however, in extensive use—the lamps being constructed in such a manner as to render them less dangerous, although the liquid itself cannot be handled with too much caution. They are preferred by many who have a strong aversion to the use of oil in any shape, and give a strong, pure white light. The camphine oil (called also pine oil) is highly rectified oil of turpentine, obtained in a variety of processes, but now usually by repeated distillation. Chemists have found that pure oil of turpentine is identical in its composition with a substance known as the basis of camphor, called camphine; and hence this term has been ap-

plied to this volatile oil, when thus prepared for use. There are also several other modes of artificial illumination applicable to the lighting of large halls, street lighting, and also to light-houses—such as the Bude light, the Drummond light, and the galvanic light recently attempted for lighting streets in Paris. The Bude light is particularly deserving of notice, from its economical and growing use in England, and its proposed application for illuminating purposes in this country. The simple elementary form of the Bude light (which is termed by Mr. Gurney, the inventor, the oxy-oil lamp) is a common argand lamp, with an interior draught of pure oxygen gas substituted for atmospheric air. The differences between a common oil lamp, an argand lamp, and the Bude light, have thus been described: The flame of an ordinary lamp is hollow—being in a state of ignition only on its outside; the interior being filled up with the vapor of oil and carburetted hydrogen gas; the flame surrounding these in the form of a cone. The argand light consists of two flames, one within the other—the inner one being produced by the interior draught of atmospheric air. In the Bude light, pure oxygen is introduced in place of atmospheric air, and, coming in contact with the nascent carbon and vapor of oil, produces an intense light—equal to two and one half best argand lamps. The effect is proportionally increased by one, two, three, or any convenient number of concentric wicks, as in the Fresnel lamp. This notable invention, in its early stage, was submitted to the severe scrutiny of Faraday; and it required three years of indefatigable application, on the part of the inventor, to remove the practical objections of this able philosopher. Recently, the flame of carburetted hydrogen (the common street gas) has been substituted for that of oil. The economy of its use in the House of Commons is as follows: "The expense of wax candles (the old method of lighting) amounted during the session to £1,300, and the nightly cost for the House of Commons alone, £5. Under Mr. Gurney's contract, the charge per annum for lighting the House is £100; and that for the committee rooms, library, &c., £130. The nightly cost for the House of Commons itself is only 12 shillings. Thus, by Mr. Gurney's new method, there accrues an annual saving of £1,030."

The Drummond light is usually understood to mean the oxi hydrogen light; but, properly speaking, the Drummond light is the oxi-hydrogen light in the focus of a parabolic reflector This name is adopted from the circumstance of its having been used in this way by Lieutenant Drummond, as a signal, during his survey on the coast of Ireland. It is the most intense of all artificial lights, except the galvanic. The chief, and perhaps the only, objection to its use for purposes of illumination, is the difficulty in rendering it constant. The galvanic light, lately introduced by way of experiment in Paris, is the brightest of all artificial lights. This is liable to the same objection as the Drummond light, viz: a difficulty in making it constant. This difficulty does not, however, seem to be insuperable; and, as the experiment is quite new, there is much hope of its success.

This light is produced by the passage of the galvanic fluid between two pieces of charcoal, of the carbon of the gas works, or of plumbago. Although the heat of the galvanic flame thus produced is the most intense known, melting down the most refractory substances; yet the carbon is unconsumed, and the light is the same whether it passes through carbonic acid gas or atmospheric air. In vacuo, its brilliancy is increased, and, in some experiments upon a large scale, has presented the astonishing spec-

tacle of an arc of intense flame one foot in length. The galvanic battery has, of late, been so much simplified and improved, that it is not at all improbable this will ere long be one of the many useful applications of this mysterious agent.

The preservation of wood, cordage, &c., is a subject much agitated of late, although, with but one exception, there have been no remarkable recent discoveries. The means of preventing the dry rot of timber, by impregnating it with metallic salts, has been known for many years, although, perhaps, there have been some improvements in the substitution of some more efficacious salts for those formerly used. The dry rot, as it is termed, refers to that species of decay in timber where there is no direct and visible agency of water; but, strictly speaking, there is no such thing as dry rot, as a piece of dry wood may be preserved in a sound state for any length of time, provided all moisture is excluded. One kind of rot in wood is that produced by a parasitical fungus, absorbing the fibres of the wood when subjected to moisture, and disorganizing its natural fabric. Another kind is that occasioned by the alternation of wet and dry conditions of the wood. The chief source of decay is from the action of air and moisture upon the soluble matters contained in the wood. By immersion in solutions of a variety of metallic salts, a combination of the salt with the soluble matters is effected; and the result is an insoluble compound, upon which moisture has no further effect.

One of the most extraordinary inventions of the present day, is the Boucherie process for impregnating wood with various saline solutions, both for the purpose of coloring, as well as preserving the wood. In this curious operation, the inventor has availed himself of the capillary (or rather vascular) action of the living plant to carry liquids into every minute pore, and effects the impregnation in a most rapid and thorough manner. In the processes first described, the impregnation is facilitated by various devices, in using the force pump or atmospheric pressure; but, here, nature is made to play a singular part—is cheated as it were—and the living plant is made to absorb chemical preparations instead of its own sap. For instance: a large poplar tree, soon after it was cut down, was placed with its foot in a solution of the pyrolignite of iron, (the liquid selected by the inventor after seven years of experiment,) and in a short time the whole tree was penetrated with the solution. The position of the tree, whether horizontal or vertical, is of no consequence as to its absorbing power; and the inventor, moreover, found that it was not necessary to cut the tree down, but that, by boring holes in the tree, and forming a trough around these, the absorption immediately took place. Some singular facts were also developed in his experiments. He found that all kinds of trees refused entirely to take up any vegetable solution, while neutral metallic solutions were absorbed with avidity. He found, also, that branches of trees, as soon as cut, begin to absorb air, and, by a simple contrivance, ascertained that a freshly cut branch will absorb five times it own volume of air. Among the results of this process are, first—that the wood is preserved from decay and the attacks of insects; that wood may be prevented from shrinking; that it is rendered almost incombustible; and that it may be, with great facility, dyed to the very heart in a perfect manner. A most singular experiment was made, in which dyeing was effected within the wood itself. A magnificent blue wood was produced, by causing a tree to absorb successively a salt of iron and the prussiate of potash—the elements of prussian blue. M. Arago

exhibited to the Academy of Sciences a column of pear-tree wood, impregnated with pyrolignite of iron, as black and hard as ebony.

Improvement in soldering.—A discovery of great consequence to all mechanics who use soft solder has been recently made. Zinc is dissolved in muriatic acid to saturation; pulverized sal ammoniac is then added to the solution, which, after being boiled for a short time, is decanted and ready for use. In using this compound, no cleaning of the metal is necessary, however much it may be oxidized; and oil, resin, and other materials used in soldering, are entirely dispensed with. It is only necessary to apply, with a bit of sponge, upon a stick or a feather, this solution to the part to be soldered, in place of the material generally used to prevent oxidation, and facilitate the flow of the solder. Such is its efficacy, that if two pieces of brass, possessing considerable surface, be wetted with this solution, and pressed together with great power, upon the application of the soldering tool the solder will immediately flow between the plates throughout, as may be easily proved by reheating and separating them suddenly.

Tanning, leather, &c.—Of late years, great changes have been wrought in the art of tanning, and very ingenious devices have been resorted to for hastening the process of tanning, which formerly occupied several years before the leather could be considered as thoroughly tanned. It is very questionable whether the new processes have been, on the whole, productive of public good; for a large proportion of the leather forced into the market contains about as much uncombined gelatin as real leather—the product of the combination of tannin and gelatin. The means resorted to are, chiefly, the use of very strong solutions, and mechanical and hydrostatic pressure. Concerning the first innovation, Doctor Ure remarks that "it has been ascertained, beyond a doubt, that the saturated infusions of astringent barks contain much less extractive matter, in proportion to their tannin, than the weak infusions; and when skin is quickly tanned, (in the former,) common experience shows that it produces leather less durable than leather slowly formed.

"The older tanners, who prided themselves on producing a substantial article, were so much impressed with the advantages of slowly impregnating skin with astringent matter, that they employed no concentrated infusion (ooze) in their pits, but stratified the skins with abundance of ground bark, and covered them with soft water, knowing that its active principles are very soluble, and that, by being gradually extracted, they would penetrate uniformly the whole of the animal fibres, instead of acting chiefly upon the surface, and making brittle leather, as the strong infusions never fail to do. In fact, 100 pounds of skin, quickly tanned in a strong infusion of bark, produce 137 pounds of leather; while 100 pounds, slowly tanned in a weak infusion, produce only 117½ pounds. The additional 19½ pounds weight in the former case serve merely to swell the tanner's bill, while they deteriorate his leather, and cause it to contain much less of the textile animal solid. Leather thus highly charged with tannin is, moreover, so spongy as to allow moisture to pass readily through its pores, to the great discomfort and danger of persons who wear shoes made of it. That the saving of time, and the increase of product, are temptations strong enough to induce many modern tanners to steep their skins in a succession of strong infusions of bark, is sufficiently intelligible; but that any shoemaker should be so ignorant or so foolish as to proclaim that his leather is made by a process so injurious to its quality, is unaccountably stupid."

Where pressure is resorted to for quickening the operation, the leather is allowed to remain in the tanning liquor but a few days, at most. The skins are sometimes sewed up into bags filled with the tanning liquor, and submitted to hydrostatic pressure in a variety of ways. The pressure of the air is also used to force the tannin into the pores of the skin. The air is first exhausted from the vats, which causes the hides to expand, and liberates the air confined within their pores; and when this operation has been sufficiently continued, the air is re-admitted, and the force-pump applied to force the liquor into the hides.

Having briefly described, in the foregoing sketch, some of the principal improvements, with their leading characteristics, in the branches of arts and sciences which come under my supervision, I trust I may be indulged, in concluding this detail, (which will doubtless be tedious to many readers,) with some reflections of a general character. It is recorded in the great book of truth, that "there is nothing new under the sun;" and the declaration finds nowhere a clearer exemplification than in the place where a superficial observer might suppose it was contradicted. The intelligent examiner will find in the model room of the Patent Office no idle schemes for creating new elements of matter—nothing of the philosopher's stone—but everywhere the utilitarian efforts of inventive genius, so to arrange and combine in other forms existing materials, as to subserve the interest and enhance the comfort of mankind. Here and there may be found models of machines, of which, when their purpose is considered, it may be said that the material was not worth the labor. But these are exceptions. The great mass of inventions are of a character to make us alike proud of the genius of our countrymen, and the Government which fosters and protects it. Man's wants increase with his progress in knowledge; and hence the paradoxical truth, that the growing number of inventions, instead of filling the measure, increases its capacity. The offspring of each distinct and notable invention may be hundreds, or even thousands; and each of these may claim its host of descendants. In an incalculable ratio will inventions increase, till space will hardly be found to preserve their representations. No other conclusion can be reached by the deep thinker upon this subject; no truth to him more forcible than that so happily expressed by Sir Humphrey Davy—"the greater the circle of light, the greater the boundary of darkness which surrounds it."

Respectfully submitted:

CHARLES G. PAGE,
Examiner of Patents.

Hon. H. L. Ellsworth,
Commissioner of Patents.

TABLE OF CONTENTS.